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CHICAGO, JULY 1913.

TABLE OF CONTENTS.

Editorial	1-4
Associations	1-2
The "Amateur Electrician"	2-3
Illinois Utility Bill	3
Zemstvo Systems in Russia	3-4
"A Lot of Loaded Lines"	4
Poles and Pole Preservation. By Russell A. Griffin	5-9
Independents Merged in Pennsylvania	9
The Lay of a Layman. By the T. E. Dopester	10-12
New Rates Around New York	12
The Telephone Scrap Book	13-16
Physical Connection Case in North Dakota	16
Automatic Methods in Long Distance. By H. M. Friendly and A. E. Burns	17-21
Nebraska Commission News	21
Contracts, Enforceable and Unenforceable. By Walter K. Towers	22-23
The Telephone Service Association Work	23
Telephones in Central Station Control. By Angus S. Hibbard	24-28
Cat Interferes with Switchboard Service	28
European Telephone Development. By Fred A. Scholz	29-33
Tri-State Association Convention at Corinth	33
Tests of Lincoln Service	34
Who's Who in the Telephone Game	35-36
Abusing the Operator in Germany	36
The Law and the Telephone. By E. J. Wenner	37
Pipe Line Telephone System in Mines	38
Exposition to Have Perfect Telephone System	38
South Dakota Commission News	38
Kansas Commission News	38
Department of Railway Telephones	39-53
Of Interest to the Trade	53-55
Brevities of the Business	56-58

ASSOCIATIONS.

INDEPENDENT telephony boasts three different and distinct interstate associations: The National Independent Telephone Association, now in its seventeenth year; the United Independent Telephone Association, still in its first year; and the Telephone Service Association, also quite new.

The two latter bodies, being of recent origin, are naturally active and enthusiastic. This may have something to do with the present activity of the older association; but there is sufficient cause, without the spur of competition, in the big problems of the year. The greatest of these problems is the effect of regulation by the Interstate Commerce Commission and the state commissions. Upon the National Association naturally falls the task of representing the independent interests before the Interstate body, if they are to be represented at all as a unit. In its plea for members this year, therefore, the National Association is offering this co-operation and representation that can be secured in no other way.

Not content with offering so much, however, the association is inaugurating a new department, which is to give service of a different kind to its members. Perhaps the most important work of this branch will be a compilation of rate data—a most vital and strangely neglected theme. If the new department did nothing else, or, indeed, if this were the sole claim to usefulness of the association, it would justify its existence as well as its membership fee. Further helps will be offered, however, in the shape of analyses of legal decisions, state commission orders and rate-making valuations. These new activities of the National Association will doubtless bring it a bigger and more heartily co-operative membership.

The United Independent Telephone Association of America, as has previously been explained in our pages, was planned to overcome some alleged drawbacks of the National Association, and so may be regarded as to some extent its competitor. Whether it intends to undertake any special work to keep up the interest in its organization, we have not heard.

The Telephone Service Association has at least two exceptional assets—the peculiarly appropriate and pleasant word *service* in its name, and the enthusiasm and energy of its manager, Frank L. Eldridge. It is in no sense a competitor of the National Association, unless a parallel effort to secure members can be called competition. It is primarily a technical association, or, rather, an association for supplying the technical wants of its members. Its object is to see that its members give good telephone service to their

patrons; which is equivalent to saying that its object is to make its members successful.

All operating telephone companies realize that good service to the public is the first qualification for success. Some companies render good service. Some companies think their service is good when it is not, because they are unfamiliar with service standards. Some companies give poor service and know it, but do not know how to make it better. And some companies, doubtless, know their service is poor and do not care.

Those companies whose service is ninety-nine per cent perfect are fortunate—and very rare. Probably they cannot be helped in any way; but presumably they are in that beatific state of mind which rejoices in an opportunity to help others—which opportunity seems to be offered by the Service Association. Those who think their service good—and there are many of this class—are probably the hardest to deal with. Once they are interested in the standards of others, however, improvement is rapid. Those who know their service might be better are, of course, the most promising subjects. For them the Service Association is doing its best work, and, with their cooperation, it can help them into the ninety-nine per cent perfect class. As for those companies who are at present indifferent to the fact that their service is not good, they cannot long remain in that state. The demands of the public are becoming more insistent and its requirements more exacting. The indifferent operator will soon be forced to interest himself in his service or give way to another who does. An organization like the Service Association will not only nourish his awakening interest, but show him how best to direct it.

Because it is intensely practical and offers something that operating companies can use, something that will help them to give better service and consequently to grow faster and to make and save more money, the Telephone Service Association is meeting with unusual success.

Two weeks ago the Mississippi Independent Telephone Association (now the Tri-State Telephone Association) held its annual convention at Corinth, Miss. Although the manager of the Telephone Service Association was advised not to take the long trip on a "wild goose chase," his enthusiasm over-ruled the suggestion. He went, and took with him a good number of the association's Operating Rule Books. The books he disposed of as fast as he could hand them out, and the interest manifested in his proposition was, he reports, extraordinary. He not only secured a number of new members, but undoubtedly aroused an interest in good service that will bear fruit later.

Service is the keystone, backbone and foundation of telephone operating. It is the logical subject for discussion and motive for organization. Therefore, the Telephone Service Association will grow more and more powerful as it becomes better appreciated.

The Nebraska Railway Commission has granted the People's Independent Telephone Company of Gordon permission to raise its telephone rates where only monthly payment is made. Business telephones under the arrangement will cost $1.75 per month instead of $1.50, as in the past, but may still be had at an annual rental of $18. Residence telephones are subject to similar provisions.

THE "AMATEUR ELECTRICIAN."

SOME years ago the term "amateur electrician" was applied with considerable freedom to young experimenters in almost any branch of natural science, even if one's equipment consisted merely of a couple of dry batteries and an electric bell, or perhaps some home-made odds and ends in the way of motors and engines, with a few catalogues and old trade magazines for a library.

But of late the phrase seems to have fallen into more or less disuse; presumably by reason of the popularizing of technical schools whose graduates and under-graduates have made us familiar with the association of ponderous subjects and young heads.

The word amateur suggests a recompense in pleasure rather than money or ambition; and to enjoy is to remember. So it is not surprising to find some of these so-called amateur electricians in possession of a really surprising store of good solid knowledge concerning the characteristics of their "hobby."

Perhaps interest in the subject was started by a casual glance into an old natural philosophy or a desire to understand the working of a toy "dollar motor." Possibly the next step was a public library card and a list of elementary technical books taking the place of the college boys' class lecture; the laboratory work of the school finding a remarkably efficient substitute in the home made apparatus, constructed with such care and attention to detail that the principles have never been forgotten.

It is this characteristic interest, sometimes amounting almost to a passion, that identifies the "born" mechanic and the "natural" scientist; and which forms the keystone of success in all technical work. With it, the farmer boy with his district school education as a starting point can achieve any reasonable ambition. Without it, the university graduate is hopeless of any great success.

Of course the perfect technical man is the one who finds himself early enough to choose his college course out of his own love for some particular branch of science, and who follows it even through hardships, perhaps paying his way through college with late hours and unpleasant work. But the fact is that this type is so rare that among the thousands of theoretical engineers who receive their graduation diplomas every year, he is not numerous enough to create any appreciable competition to the grammar school man whose devotion to his chosen work is based on the same love and interest.

The young man whose hobby has been electricity or mechanics has absorbed knowledge of its principles and practice for the same reason and with the same thoroughness that the baseball "fan" knows the record and prospects of each team, even of each individual player; or the stamp collector knows the value and history of each bit of engraved paper in his possession. And in the commercial use of this knowledge he has the choice of several good starting points.

Right here is a good place to point out that even the college man often starts at his first job for seven or eight dollars a week. You can show your worth better after you get inside than you can explain it to the prospective employer, unless you are an unusually good talker. As a matter of fact, it is rather an advantage to start at a low salary. Working for five dollars a week and learning the practical side of the

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work is cheaper than paying money out at school to learn it; and the theoretical side you will read up on at odd moments, and enjoy it, too, if you are "born to it."

It is reasonable to assume that the man with a mind to enjoy scientific literature has common sense to carry him through the ordinary conditions of intelligent and efficient service with any employer.

And as to choosing the employer, this should be no difficult matter even to young men going to work for the first time. Take, for instance, an electrical supply house or telephone manufacturing concern; in the office, the stock room, the shipping room, or the drafting department are countless openings for an interested young man with a disregard for the amount of his first salary. That is the point; take the first job not for a living, but for an education.

With this thought in mind the hardest work is a source of satisfaction if not pleasure; and with the constant meeting of old friends in the shape of batteries, motors and other apparatus whose description in book or catalogue has been pored over so eagerly, time passes quickly enough.

It would be a strange employer who did not take some interest in a young man of this type, and gladly give him further opportunity by allowing him to change departments from time to time. Not at an increased salary, mind you; that will come later, it is not a part of our consideration at present.

Nor need we begin to worry as yet about the higher mathematics and calculations which we are so sure we will be called upon to use when we attain that coveted goal, the engineering department. It is to be feared that we will hardly arrive there for some years; and by the time we do, we will be pretty familiar with the business and will be "wise" to the fact that one may obtain so many tables and ready made formulæ for all kinds of work that it seems hardly worth a busy man's while to learn the long operations involved in working them out. Again, common sense and a knowledge of the general fitness of things will surely solve the problems of the day even while the technical graduate lacking the intuitive wisdom given to those who love their work is in the first equation of his calculation.

Above all, keep up your interest; read up on the theoretical while you observe the practical all about you; cultivate a good memory, a strong will and a sanguine spirit, and you will be able to give your sons that college education which you did not find necessary for yourself.

ILLINOIS' UTILITY BILL.

MONDAY, June 30, Governor Dunne signed the Illinois Public Utilities bill, which provides for a commission to supervise the public service companies of the whole state, including Chicago. This commission is intended to work on an annual appropriation of $100,000.

The city of Chicago is naturally up in arms because it is deprived of the power to rule its own utilities, the largest in the state, and there is some talk of court action. The state of New York is cited as an example, its utility regulation being divided between two commissions—one handling all the state outside of New York City, the other handling the city alone. In spite of this example, and of the natural demand of municipalities for home rule, it would be possible to have efficient control vested in a single state commission, even where a city as big as Chicago is included, but not on $100,000 a year. New York state needs $700,000 a year for regulation alone. Illinois cannot expect satisfactory results on less than $500,000 a year.

ZEMSTVO SYSTEMS IN RUSSIA

CONSUL General John H. Snodgrass, Moscow, Russia says the Russian zemstvo telephone system was first established in the Lebedinski district of Kharkof province. The opening of this line of August 18, 1899, marked an era in telephone construction throughout the rural sections.

Later on a telephone system was established in the Lokhvitzki district of Poltava Government. This was opened in 1901. The Samara district zemstvo established telephonic connections the same year between the zemstvo board and seven of the principal sections of the country. In 1902 a telephone line was opened in the Bakhmut district of Yekaterinoslav Government; this proved to be the largest of the district systems, comprising about 100 apparatuses and extending about 310 miles. In the same year a line was opened by the zemstvo of the Sudshan district, Kursk Government.

All these telephone systems were established and managed on the principle of so-called private telephones, i. e., those intended for the sole use of the persons or institutions owning them. Others were not allowed to use them. Naturally such a restriction was most inconvenient, especially in an industrial center like Bakhmut. Therefore, the Bakhmut zemstvo petitioned in 1902 that it might exploit its lines on the same basis as those intended for public use, i. e., that anyone might use the telephone by subscribing to the same, or for a certain sum paid for every communication over the telephone.

Owing to this petition new rules concerning the zemstvo telephones were issued on February 15, 1903, which gave them a wider scope for action. These rules instituted an entirely new system run by the zemstvo and adapted for the use of the whole district. The right to establish and exploit such lines was vested in the zemstvos, and from that moment the zemstvo telephone began to flourish.

During the seven years 1902-1909 about 70 district telephone systems were arranged by the zemstva. It was mainly the district zemstvo which established and exploited these lines. Provincial zemstvo boards merely expressed approval of the action of the district zemstva, and in some cases made short-term loans for the construction of the lines. The Kazan zemstvo was the first one which took upon itself the business of establishing a telephone system for a whole Province. This system was over 867 miles in length and possessed 1,867 miles of wire and more than 30 intermediate stations. It is the largest zemstvo telephone system in the empire, not only being complementary to the imperial government post and telegraph service in the province, but even competing with the latter. The management has assumed a distinctly commercial character.

In 1906 a telephone system was arranged on the same principles in the Province of Mohilev and in 1909 in the Province of Poltava.

In order to establish connection between their own telephones and those of the imperial government, the zemstva were compelled to construct lines of considerable length and cost. To cover the expenses incurred by exploiting these lines on a special basis, some of the con-

necting lines between the zemstvo and the imperial government systems are used expressly for communication between different cities. Such lines, connecting the chief commercial and industrial centers and open for the use of the general public at special rates, have the distinct character of telephone lines managed by private persons on a commercial basis.

In 1909 the chief department of posts and telegraphs began to consider the zemstvo telephones as commercial enterprises and granted permission for establishing such systems only for general use on the same conditions as were applied in the case of private enterprises. The zemstvo was now bound to obtain a concession for 18 years, to pay to the imperial government 15 per cent of the gross income, and, when the concession expired, to hand over the whole telephone system to the imperial government free of charge. Later on more restrictions were introduced and the imperial government reserved to itself the right to purchase the whole of the zemstvo telephone system seven years after it had been opened.

Exploiting telephone lines is not a profitable enterprise for the zemstva, as the majority of institutions and persons use them free of charge for zemstvo business. The zemstva spend considerable sums constructing and maintaining telephone systems. The business is made more profitable in those cases where it is possible to connect all the larger cities or other centers within the zemstvo telephone zone in the neighborhood district with each other and to adapt the service for the use of the public.

There are 772 districts in Russia. In 120, telephone lines have been constructed by the zemstva. There remain for construction 652 zemstvo lines.

The combined zemstvo companies possess about 7,100 apparatuses, 16,000 miles of lines, 30,000 miles of wire, and several hundred central and intermediate stations. More than $1,500,000 has been spent by them for constructing telephone systems. Loans run for 10 to 30 years and were negotiated with insurance companies. The cost of constructing telephone lines with one wire varies in the different districts from $35 to $45 per mile. The average cost of 1 mile of wire is $20. A telephone apparatus costs $18 to $25 with installation.

The technical construction of the zemstvo telephones is very much the same as that of the imperial government lines. In cities the zemstva mostly use bronze wire 1.2 millimeters (0.0472 inch) in diameter. For lines in the districts galvanized-steel wire 2.5 millimeters (0.0984 inch) in diameter is employed. The construction work is under the control of the zemstva, but is sometimes sublet to private companies.

The annual subscription to a zemstvo district telephone is customarily $12.50 to $23. A few of the zemstva charge $30 to $35. The Bakhmut zemstvo rates are $75 a year.

MONTANA COMMISSION NEWS

Attorney General Kelly rendered an opinion at Helena at the request of the state public service commission, which had been appealed to by citizens of Hamilton, who desire the consolidation of the Bell and Independent telephone companies, that they may not be obliged to pay for two services. The attorney general advises the commission that the law of Montana forbids the consolidation of two competing telephone companies in the state and, therefore, the request of the citizens of Hamilton for such consolidation cannot be considered.

A Lot of Loaded Lines

HOT.

When it is hot,
And pavements reek and scorching sunlight glares,
While crowded cars incinerate their fares,
I like to stay where I can be at ease,
And e'en, perchance, locate a cooling breeze,
The while I pay my calls (and, too, receive them)
Take in my orders, give them out or leave them,
In short, to do all things that must be done—
Except to eat and sleep—by telephone,
When it is hot.

The Manchester (England) Ratepayers' Association has refused to sanction a loan for electric light purposes, on the ground that "electricity may become obsolete." What a fast pace we are traveling, to be sure! In a few years we may be telling our grandchildren about the funny thing called a telephone that we used to talk through.

Which brings up the prophetic comment uttered by the editor of the *Electrical Review* thirty years ago: "The novelty of answering on the telephone is gradually wearing off, and it may not be a great while before it will be hard to get the person wanted to give a responsive ear to the instrument. 'Can't raise them' is beginning to be heard with at least noticeable frequency on telephone lines." In thirty years novelty has given way to necessity. Our complaint today is not that people do not answer, but that they take their own sweet time to do it. And meanwhile the operator catches it from the impatient calling party.

THE SECOND POST.

[Letter Received by the Vote-Berger Mfg. Co.]

Dear Sir this letter is to acknolage to you of the recept of your two ball adjusters but in addition I will make you understand that I misunderstood you. I thought that it was a lamp by itselph and not a aparatus which is of no use to me as I have no curent of electrice so you see. I want to send them back to you again and you send my money back to and nothing more to say your trully.

PROBABLY NOT EFFECTIVE, EITHER.

[From a St. Louis newspaper.]

The general manager said that nothing was new concerning the probable strike. He contends, however, that the service will not be effected if the girls decide to strike.

HE EVIDENTLY INTENDS TO RETIRE.

[From the Canadian *Electrical News.*]

The resignation of Mr. T. P. Marshall as superintendent of Stations, of the Toronto Electric Light Company, Limited, was marked by a very pleasant and enjoyable evening at his home at 225 Booth avenue, Toronto, when a large and representative deputation of the Operating Department presented him with a leather couch as a token of their regard.

ONE WOULD SUPPOSE THAT TO BE THE SAFEST KIND.

[From *The Gas Engine.*]

It is usually agreed that Ely, Kearney, Badger and other aviators have been killed on account of wreckless flying.

A TRIBUTE TO THE LINELADY.

[From the Cheyenne *State Leader.*]

An illustration of what western women can do, if necessary, was exemplified last week when Mrs. Beckman, wife of our telephone lineman in his absence, mounted a horse, and taking with her a full kit of repairs, set out to repair the David line which was out of commission. She found the break, did a full job of repairing, and then rode to the nearest house where a phone was installed to test her work, and finding the line in perfect order, returned home, arriving about 9 p. m., having been gone several hours and covering a distance of about fourteen miles and having left with a neighbor her five-months-old baby. This is what we call a lucky job, and one instance only where our telephone people made good.

One of the intelligent members of parliament of Great Britain suggests that the figure 9 be eliminated from telephone parliance because of its phonetic similarity to 5. You can while away a pleasant hour in figuring out what this would do to the system. In Germany, however, the sound of 9 means nothing anyway.

P. H. W.

Poles and Pole Preservation

By Russell A. Griffin

Paper read before the National Electric Light Association.

FEW subjects in recent years have received closer or more careful and earnest study and research than that pertaining to the proper building of pole lines and to the preservation of those lines after they are built. Of primary importance is the selection of the best woods to use for poles and then the determination of the size of poles to insure the necessary strength for a required capacity. Finally, and quite as essential to the interests of the operating companies, is the question of the preservation from decay of the poles in their lines, in order to insure the maximum life at a minimum investment. This latter question is one that may also properly be classified as a feature of the great question of the conservation of the country's timber supply in which our government is so vitally and properly interested at the present time.

The demand for wooden poles during the past few years by the telephone and telegraph companies, the electric light and power companies and by the railroads, has been enormous. The latest census report shows that in 1910 approximately 3,870,000 poles were purchased—this means a similar number of trees, for ordinarily but one pole is made from a tree. The consumption in 1911 and 1912 was unquestionably greater, though no census figures have been furnished. My company alone, which distributed throughout the entire United States, in 1912, sold, handled and shipped, considerably over a million poles, and our shipments this year are being made at the rate of over one and one quarter of a million poles. I cite these figures in order that you may the better appreciate the drain on our forests and the consequent necessity for immediate careful consideration of the best methods for preserving your pole lines. Four million poles a year, at say an average of $3.00 each, is an annual investment of $12,000,000.

At the end of the year 1912, the Bell telephone system owned 315,000 miles of pole line, or at 40 poles to the mile, 12,600,000 poles. Add to this approximately 225,000 miles of pole line in the plant of the Western Union Telegraph Company and we find over 20,500,000 poles standing today in the lines of these two great systems; sufficient to build a continuous pole line 21½ times around the world. To reproduce this plant would (on a basis of an average of 40 poles to the acre, which is a fair approximate production) require a forest of 800 square miles. In addition, the electric light and power companies are purchasing wooden poles now at the rate of approximately 700,000 poles a year. Within a very short time we shall unquestionably see an annual demand in this country for maintenance and replacements alone of 2,500,000 poles. We can figure the average life of an untreated cedar or chestnut pole, set in the ground, as 12 to 15 years. It requires an average of about 60 years for a tree to attain a growth suitable for poles; it is seen, therefore, that the production takes place at about one-fifth the rate of consumption. The actual amount of available timber is constantly decreasing, but we see no corresponding decrease in the demand, but rather an increase, and the actual supply today is being greatly taxed to meet the great demands upon it. It would therefore seem to be essential:

(1) That even better attention be given to the preservation of our forests.

(2) That better care be given the economical utilization of our present timber supply.

(3) That the large users of poles should at once make preparation for the preservative treatment of their permanent lines by artificial methods.

The timber resources of this country have been so vast that we have without thought wasted them, until now we are facing the vital necessity of greater care and thought for the future.

The problem of increasing the life and service of wood is one which is of the greatest general interest to every consumer of timber today. It is the problem in its application to poles that I wish particularly to treat.

The trees of this country are divided into three classes:

(1) The needle-leaved or conifers, such as cedars, pines, etc.

(2) The broad-leaved trees, such as maple, hickory, elm, oak, chestnut, etc., and

(3) The palms.

The broad-leaved trees are deciduous, i. e., they shed their leaves annually, while the conifers are known as evergreens. In the lumber trade the broad-leaved trees are generally known as "hardwood," while the conifers, or evergreens, are known as "softwoods."

Wood is composed of a multitude of cells or tubes, closed at the ends, and which are firmly united and which lie up together to form the wood structure. The wood cells are not uniform, but differ in their diameter and length and the thickness of their walls. A new layer of wood is formed each year on a living tree, covering the entire trunk, and all the branches. Each layer forms a complete casing around its inner neighbor so that the whole tree is built up of a series of cylinders, or cones. It is the outermost rings of the wood in a tree that carry the sap and constitute the living elements. It is in them that the circulation of water takes place. As the center of the trunk is approached the wood cells gradually lose their contents and become filled with air; it is this part of the tree that is known as the heart. The heartwood in most trees is easily distinguished from the sapwood by its darker color. The heartwood has no part in the life of the tree and no sap is carried through the heart. The depth to which the living elements extend depends on the nature of the tree. In some trees it extends through some 30 rings, or 30 years of growth, while in others, such as red cedar, through but 15 rings. The heartwood contains less of water and starches than the sapwood and the walls of these mature cells are filled with coloring matter, such as resins and gums, making the heartwood heavier, harder and more durable than the sapwood; consequently the greater the proportion of heartwood, the more durable is the wood.

Only those woods which are the most durable after the trees are cut are used for poles—durability in wood meaning the length of time which it remains serviceable as a consequence of the sound condition of its fiber and its freedom from decay. Timber is classified as long-lived and short-lived, in proportion to its ability to resist decay. Hardness and density apparently have no bearing one way or the other on its durability; white oak, for example, though a very hard and strong wood, decays very rapidly in the ground, and consequently is not suitable for poles, whereas the light, porous and in some respects, defective swamp cedar, resists decay and is a comparatively long-lived timber. Chestnut wood is stronger and heavier than cedar and makes an excellent pole, though the process of decay is somewhat more rapid than in the cedars. Cedar (both northern and western) is used more extensively for poles than any other wood, over 60 per cent of the consumption at present being of this wood. At present, by far the largest part of the cedar poles are produced in Minnesota, Wisconsin and Michigan, but the Northwest (Washington and Idaho, as well as British Columbia) is being called upon for a constantly increasing supply. A highly organized system of producing and distributing cedar poles by modern lumbering methods, has been developed, in which my company has become very much interested in the past ten years.

Next in importance to cedar for use as poles is chestnut, grown in the eastern states. This wood supplies approximately twenty per cent of the poles used. The chestnut is rapidly disappearing in consequence of a very serious blight which has affected very wide areas. Even though dead at the time of cutting, if the wood is sound, the tree is entirely suitable for use as poles. Government investigations show that this blight, which is a bark disease, kills the tree by girding the trunk and that unsound or rotten wood is not a consequence of the disease. Strength tests made upon chestnut killed by the bark disease, show that sound wood from dead trees is as strong as the green wood of the same species, seasoned to the same dryness.

By the decay of timber we mean the change from the sound or perfect condition, to an inferior state. It is now known that decay is caused by the activity of lower forms of animal and plant life. The living organisms which cause the decay of wood may be insects, bacteria or fungi. Insects bore into the sound wood and sometimes so riddle it that it falls to pieces. These insects, such as beetles and white ants, are particularly active in the hot climates, and the teredo abound in southern water; but decay in the sense in which it is usually understood is caused by bacteria or fungi. These fungi are so minute that they can be seen only by the aid of a powerful microscope, but the fruiting bodies of these fungi, commonly called toadstools, are familiar objects to you all. They are a lower class of plant life which obtain their food by breaking up the chemical compounds of which wood is composed. They bring about changes in the wood by excreting chemical substances known as ferments, which exert a soluble action on the wood cells. The conditions necessary for, and favoring the development of the wood-destroying fungi, are:

(1) Organic food materials,
(2) Air,
(3) Water,
(4) Heat.

If one or more of these essential requirements is lacking the fungi cannot thrive and the decay of the timber will be prevented. Wood continually submerged in water will not rot because of insufficient supply of air, nor will decay occur where the wood is not subjected to moisture. No fungus growth will take place under water or in the ground at a depth of two feet or more.

The decay of a pole takes place principally at the ground line. The upper part of the pole, permanently in the air, and exposed to little or no water, except rain from which it rapidly dries, is rarely found decayed. The deeply buried part of the butt, though permanently damp, does not decay, because it is devoid of air. The maximum decay in a pole therefore occurs at the point where it is subject to the combination of air, moisture and heat. The ground holding the moisture keeping the timber constantly in an environment of air. Even under the best conditions we can get but a short life out of our poles, notwithstanding that they are selected from the long-lived timbers. It is for this reason that recourse has been taken, in many instances, to chemical means to make these poles immune to decay.

Chemical preservation involves the injection into the wood of some substance which will poison the fungi which cause the decay. There are a large number of so-called wood preservatives on the market of which but a few have been found worthy of the name, or of much consideration. The ideal preservative should conform to the following conditions:

(1) It should be highly preservative; that is, poisonous to bacteria and other destroying agencies.

(2) It should be of a character to penetrate the wood easily and deeply.

(3) It should remain in the wood and not be soluble or volatile.

(4) It should be cheap.

Experience here and abroad has shown that the best timber preservative is coal tar creosote, though other preservatives, such as chloride of zinc, copper sulphate and bichloride of mercury, have been used with varying degrees of success, but the coal tar creosotes combine the essentials above enumerated to a greater degree than any other preservative yet discovered or introduced.

Many methods for the preservation of timber have been tried but with no very gratifying results. I will refer to some of them briefly.

CHARRING

This method has been practiced from the earliest times. It is of some value, but has its limitations and must be considered at best as only of temporary benefit. Its disadvantage consists in the fact that it is liable to make large checks through which the germs of decay may pass into the body of the wood. Charring is really a detriment unless the wood is absolutely dry; if green or wet wood is charred, a more or less impervious layer is formed on the outside of the wood which prevents evaporation from the interior of the poles and consequently tends to hasten rather than retard decay.

CONCRETE OR LOOSE STONE SETTING

The practice of setting poles in concrete or broken stone has been often followed. The broken stone has given fair results as it allows ventilation and prevents the collection of water. If poles are set in concrete, sufficient air is sure to get in between the pole and the jacket to permit the development of the decay producing fungi.

TAR OR ASPHALT COATING.

These substances have no penetration or antiseptic properties and therefore merely act as a protective jacket. Sufficient air and moisture, however, will work in between the surface of the pole and its covering, to permit decay.

PAINTING.

Painting hinders the entrance of fungus germs and in consequence tends to act as a preservative, but again if the wood is painted while green, the effect is only to hasten decay as the excess moisture is held in the wood.

CREOSOTING.

Unquestionably the most perfect method of timber preservation at the present time, is the injection of coal tar creosote or dead oil of coal tar into the timber. In commercial practice this is done in three ways:

(1) By the closed tank pressure method,

(2) By the open tank method, and

(3) By application with a brush.

I shall attempt to treat these three methods briefly and cite you some of the results which have thus far been obtained in this country. This process of treatment of poles is the only one known at present, which will not only prevent the decay of timber, but which will resist the attack of timber-destroying insects. The work, however, must be honestly and efficiently done; this is of primary importance—unfortunately much fraud has been practiced at various treating plants in this country by the substitution of inferior or adulterated oil, or by injecting into the timber less oil than the quantity specified.

Dead oil of coal tar, or coal tar creosote, is one of the by-products of the manufacture of coal gas. It is not known absolutely as to just what components of the oil the preservative process is due, but the efficiency of dead of coal tar and carbolineum (which is practically dead oil of coal tar with many of its lighter distilling constituents removed) has been amply proven, not only in this country, but abroad, and they are now generally recognized as the most effective timber preservatives and best adapted to the treatment of poles. We know that poles treated by this process in England 50 years ago are still in service and in sound condition, and complete government records in Germany for the past 50 years demonstrate the superiority of this preservative over all others. American practice and opinion coincide with these results, though our experience has not extended over so many years.

In 1897, while in the service of the American Telephone and Telegraph Company, I arranged for the purchase of some 10,000 creosoted yellow pine poles for a line which was built in that year from Washington, District of Columbia, to Norfolk, Va. These poles were treated their entire length by the closed cylinder pressure process at the works of the Norfolk Creosoting Company, under a specification requiring the injection of 12 pounds of dead oil of coal tar to the cubic foot. A recent inspection of this line showed it to be in practically a perfect state of preservation. It is safe to say that these same poles, untreated, would have served their usefulness in about four years, as yellow pine rots very rapidly in the ground.

CLOSED CYLINDER PRESSURE TREATMENT.

I shall not attempt to describe in detail the method of treatment by the closed cylinder pressure process, but the experiments and investigations which have been conducted by the American Telephone and Telegraph Company during the past ten years or more have indicated that yellow pine can be economically utilized for poles when thus treated, in a large section of this country, particularly in the South. However, on account of the expense of this complete treatment in other sections of the country, many experiments in the partial treatment of poles by the open tank and brush method have been conducted, and I am glad to say that the results thus far obtained have been most gratifying, and even better than at first anticipated.

It is not practical, even with the best methods of treatment, to impregnate the wood throughout, nor is such a penetration necessary. The value of the treatment consists in forming an outer protective envelope around the untreated heart; the thickness necessary for this envelope depending on the use to which the timber is to be put, as well as the character of the wood and the character of the soil in which it is placed. In general, the antiseptic preservative should penetrate deep enough to prevent exposure of the untreated interior by abrasions, checking, etc.

In spite of the excellent results that have been obtained both here and abroad by the full cylinder treatment, such as was used on the Washington-Norfolk line referred to before, the proportion of poles thus treated, as compared to the total number of poles in use, has been relatively small. This method has been resorted to principally in the South, where, on accouunt of the climate and soil conditions, exceptionally rapid decay makes a preservative treatment almost essential. The chief hindrances to a more general adoption of this method for

treatment of poles have been the high cost of the treatment and the expense of the transportation of the poles to a treating plant. Recent investigations have therefore been conducted mostly with cheaper and simpler methods, and with treatments which could be applied locally by the consumer, or at the large cedar concentrating pole yards. It should be remembered that approximately 60 per cent of the poles in use are cedar, and about 20 per cent chestnut, and these woods lend themselves readily to the method of partial treatment, which I shall describe.

BRUSH TREATMENT.

The brush treatment consists in painting the pole with a preservative, preferably creosote oil. As it is conceded that the portion of the pole most subject to decay is just below and just above the ground line, that is the part selected for treatment; for that part fails when the balance of the pole is still in a good state of preservation and consequently the usefulness of the pole depends upon the length of time that this part can be kept in a state of preservation. The pole should, therefore, be painted about 2 feet below and 2 feet above the ground line, or over that section between 4 and 8 feet from the butt. I would particularly emphasize the fact that only seasoned poles should be treated and that care should be taken to see that the wood is thoroughly dry before the treatment is applied.

It is decidedly preferable that the preservative should be heated to a temperature of 150 to 175 degrees Fahr., and distinctly better results will be obtained from two, rather than one coat. Particular attention should be paid to the filling of all checks and knot holes, and to working the preservatives well into the wood. An average 30-foot pole will absorb, by this treatment, about 4 pounds of oil, or one half gallon, and if treated under proper conditions a penetration ranging from one-sixteenth to one-eighth of an inch can be secured. The method of brush treating has an advantage that it can be applied with ease in any locality, or along the route of a line in the process of construction. It is also a very economical method. In the year 1911 the American Telephone and Telegraph Company treated 12,000 poles with creosote oil by this method in Nebraska, at a cost of approximately 25 cents per pole; this cost included the cost of the oil and labor. Previous reports of experiments in brush treating estimated an increased life of from two to three years as a result of this treatment, but access to as yet unpublished data, which it has been my privilege to review, indicates that in actual service these estimates will be substantially exceeded, if not doubled. The depth of penetration is comparatively slight, but experience has shown that the protection afforded by the brush treatment is usually destroyed through mechanical impairment, rather than through loss of the preservative by volatilization or leaching, provided always that the material used for treatment is one of the oils known to possess good antiseptic properties.

OPEN TANK TREATMENT.

Treatment by this method consists in placing the butt end of the pole in a tank into which an antiseptic preservative, preferably dead oil of coal tar or carbolineum, is poured until the poles are covered for a distance of about 8 feet, or from the butt end to a point equivalent to 2 feet above the ground line. The oil should then be heated to a temperature above the boiling point of water. The best practice would seem to indicate that this temperature should be maintained until the air in the wood has been expanded and the water in the outer layers vaporized and both driven out as far as possible. In other words, the high temperature should be maintained until bubbles cease to appear on the surface of the oil. The oil should then be permitted to cool, or else the poles be transferred to another tank containing cold oil; a partial vacuum is thus produced by the contraction of the air and the condensation of the moisture remaining in the wood, and the preservative, as a result, is forced under atmospheric pressure into the wood. A treatment by the method described consumes about 24 hours, during which the pole is subjected to the hot oil from 8 to 9 hours. In 1905, the American Telephone and Telegraph Company treated by this method and by the brush method 600 chestnut poles, which were set that same year in their toll lines between Warren, Pa., and Buffalo, N. Y. The balance of the poles in this line were untreated, part green and part seasoned. The treatment was made in conjunction with representatives of the Government Forestry Department, and various preservatives were used. An inspection of this line made three years ago, five years subsequent to its erection, again in conjunction with the Forestry Department representatives, developed the fact that 100 per cent of the green, untreated poles showed an average loss of circumference at the ground line from decay 1.16 inches, 99 per cent of the seasoned, untreated poles showed an average loss of 1 inch. Of the brush-treated poles, decidedly the best results were obtained from those treated with coal tar creosote and carbolineum. Decay had commenced sooner and developed much more rapidly in the poles brush-treated with other preservatives. Only 14 per cent of the poles brush-treated with the coal tar creosote oils showed any sign of decay and the average loss in circumference of those in which decay had started was from 0.02 to 0.04 of an inch. You will thus see that though the untreated poles had decayed to the extent of from 1 inch to 1.16 inches, the poles which received a two-coat brush treatment of coal tar creosote had been held in a perfect state of preservation for nearly five years and had only just begun to show signs of decay at the time the inspection was made. The inspection further disclosed the fact that every pole which had received the open-tank treatment which I have described, was in a perfect state of preservation. This would seem to be an ample demonstration of the efficiency of the open tank treatment. The greater depth of penetration obtained in the open-tank treatment (approximately two to four times the depth obtained in the best and most careful brush treatment), justifies the expectation that mechanical impairment and damage from checks will not play so important a part in connection with the initiation of decay as in the case of brush-treated poles. It should be thoroughly understood, however, that the results from an open-tank treatment, such as I have described and from which a thorough impregnation is secured, will unquestionably be much superior to the results which may be expected from a short period dipping treatment, which has been, and is still, frequently advertised as an "open-tank treatment." If not properly performed the open-tank treatment will not give a penetration appreciably different from that obtained in a two-coat brush treatment and it may safely be considered that a short-period dipping treatment can be ranked only as about equivalent to brush treatments, rather than as in any way comparable with what I should call the *true* open-tank treatment and which was originally developed in the co-operative work undertaken by the engineering department of the American Telephone and Telegraph

Company, and the Forest Service of the United States government.

Tests have shown that an average 30-foot northern cedar pole will absorb, when treated by this method, about 48 pounds of creosote oil, or about 6 gallons. The western or Idaho cedar poles will absorb on the average about a gallon less and chestnut about half as much as the northern cedar. On this basis the northern cedar is the most expensive to treat of the more largely used woods, but as it absorbs more oil with a consequent greater penetration, the results should justify the somewhat higher cost. For the sake of comparison we may say that a 30-foot chestnut pole can be treated for 75 cents, whereas, on account of the greater quantity of oil consumed, it will cost approximately $1.00 to treat a cedar pole of the same size.

Some experiments have been made in the treatment of western yellow pine in California. This wood will absorb 20 per cent more oil than northern cedar.

Independents Merged in Pennsylvania

The filing of papers attesting to the merger of three independent telephone companies under the name of the Huntingdon & Clearfield Telephone Company, with an office at Clearfield, Pa., has attracted considerable attention to the possibility of this company becoming the central figure in independent service, which was attempted by the people who promoted the American Union Company.

The American Union was formed with the idea of being the holding company for all independent companies in the state and including a number elsewhere, but it went into the hands of receivers and its component parts have been separated.

The merger takes over the Cambria Telephone & Telegraph Company, which was chartered on September 30, 1901, and whose charter gives it rights in twenty-six counties, including Allegheny and all of the other counties in the southwestern part of the state; Philadelphia and all of the southeastern counties up the Susquehanna river and practically every Central Pennsylvania county south of Williamsport and Ridgway. This Cambria company took over the Northern Cambria and Cresson Companies some time ago.

The merger was effected by uniting the Indiana Telephone Company, chartered March 18, 1899, and having an authorized capital of $150,000; Cambria Telephone & Telegraph Company, chartered September 30, 1901, with an authorized capital of $200,000, and the Huntingdon & Clearfield Telephone Company, incorporated November 19, 1900, with an authorized capital of $500,000. The directors of the three companies and of the merged company, which will have a capital of $850,000, are the same, being: A. W. Lee, president; John Wrigley and Singleton Bell, Clearfield; Rembrandt Peale, St. Benedict's, and H. J. Patton, Philadelphia.

Chicago Independent Wants Franchise Amended

Elimination of that provision of its 1899 franchise prohibiting it from selling its telephone business to a competitor is asked by the Illinois Telephone and Telegraph Company, under the grant of which the automatic telephone system in Chicago is operated.

Members of the council committee on gas, oil, and electric light were surprised when the proposed amendment was read by the secretary. Their first idea was that negotiations had been opened for the sale of the automatic system to the Chicago Telephone Company.

This assumption was denied by representatives of both corporations later, and Daniel J. Schuyler, attorney for the Chicago Tunnel Company, the successor of the Illinois Telephone and Telegraph Company, said the communication accompanying the amendment was a complete statement of the reason for the request upon the council.

"The Illinois Telephone and Telegraph Company," said J. W. Callahan, general manager, in this communication, "finds itself in a position where its securities are not marketable unless this prohibition shall be eliminated."

"We have no trade on," said B. E. Sunny, president of the Chicago Telephone Company, "and there have been no advances made from either side for the purchase of the automatic system by our company."

Alonzo Burt on Telephone Organization

A good form of organization is the first factor in the formula of success of a corporation, according to Alonzo Burt, vice-president of the Chicago Telephone Company, who addressed the Electric Club at its weekly luncheon at the Hotel Sherman. Mr. Burt also pointed out the enormous increase in the number of telephones since they were first installed in Chicago in 1877. He prophesied that in a few years there would be a million telephones operated by the company in Chicago.

"Pick out any one of a few good types," said Mr. Burt, "when you incorporate your company, see that you have proper coördination of the various units, teach the units what they should do, and you are on the high road to success. Capitalization is important, and without sufficient funds any company will fail. But many companies with poor organization fail, even if they have unlimited funds at their command."

Mr. Burt then gave a brief sketch of the organization of the Bell Telephone Company and showed how the systems of five states were operated from Chicago.

"In a few years there will be a million telephones operated by us in Chicago," said Mr. Burt. "There are now about 400,000, including the suburbs. The increase will come about through the increased uses which are being discovered for the telephone.

"Chicago has a larger development of telephones per capita than New York. The territory covered by the two systems is the same, but New York has only 100,000 more telephones than Chicago. The first telephone was installed in this city in 1877, but it was not put to any practical use until 1882. From that time the number of Bell telephones increased rapidly.

"There are 8,000,000 telephones operated by this system in the country."

Anderson, Ind., Talks Municipal Ownership

The citizen's telephone committee of Anderson, Ind., adopted a resolution setting forth the committee's conclusion that the Indiana Public Service Commission be petitioned to hear the wishes of the committee on a plan for a municipal telephone exchange. Such an exchange would not be possible in the face of two local telephone exchanges in operation. The committee realizes that fact. The committee proposes, as stated in its resolution, that a physical valuation be placed on one or both of the local exchanges with a view to acquiring an exchange and converting it into a municipal plant.

The Lay of a Layman

By the T. E. Dopester

THESE are the dog days of our discontent. Twice a year, in July and January, there are a few advertisers—manufacturers of product for telephone companies—who withdraw their announcements from the pages of the trade press. We have never learned why. In January they may be taking stock and in July they may be going fishing, but we only surmise these things. At any rate, it is not unusual to receive a few letters which purr those disconcerting tones: "Please discontinue our advertisement." We are reasonably sure that no advertising representative gets the brunt of the blow. It falls on the head of the house, because the telephone journals pay salaries instead of commissions.

* * *

We find ourselves hard pressed to explain these temporary breathing spells of the advertiser, because if there is need to advertise at all, that need is all the time. The telephone field is idealistic for the journal to the trade. There are comparatively few buyers and they are scattered across the continent in accessible places If they represent the larger operating companies, their first names are known to every manufacturer. And there are comparatively few makers of telephone apparatus. If there is a buyer who is not familiar with the maker and his complete line, he must be very new indeed. It would seem to be an extravagance to advertise at all! We had a complaint a while ago that the cost per inquiry was running too high for the advertiser, and he was going to rest a while. Until then, we had never thought the advertiser was looking at it that way! We know we wouldn't.

* * *

During the first six months of TELEPHONE ENGINEER it carried an advertisement and then lost it. The advertisement cost the advertiser $54 and failed to draw business that could be traced directly to its key. Four months afterward, this advertiser got a letter from Johannesburg, Transvaal, asking for details concerning this maker's product. A year later, after numerous sales had resulted, this advertiser in opening a letter from this very valued customer, discovered a key with which he was unfamiliar. Investigation of his files showed that the customer had always used that key and it eventually was discovered that TELEPHONE ENGINEER got the credit on that original $54 expenditure. You never can tell.

* * *

Advertising in TELEPHONE ENGINEER, or any other telephone trade journal, should not be judged on a cost per inquiry basis. If the advertising was placed on a percentage of gross business basis the telephone journals would bulge with advertising. It isn't an idle statement to say that the telephone companies of this country buy $7,000,000 worth of product every month. The telephone journals have something to do in influencing the minds of men who make these purchases. It isn't a traceable influence. The best story of telephone trade journal direct-result inquiry developed a dozen years ago when an advertiser, answering an inquiry, sent a reading page which he had torn from a telephone journal to make his explanation more lucid. It so happened that the page described in detail the thing inquired about. This same page—on its reverse side—carried the description and address of another maker's apparatus, which seemed to have interest for the prospective customer. Out of the printed matter the first maker had supplied, the second maker got the business. Both were advertisers in the same trade journal, but in this case the journal had never reached the ultimate buyer. So many orders resulted from a modest beginning that the story eventually came out. And that same customer never would and never did subscribe for a telephone journal. But it pays to advertise.

* * *

Better to illustrate the need of constant representation on the part of the advertiser in the telephone field, we'll take a parallel case which happened in a similar field. For you will concede that telephone product is practically standard. A pole is a pole, and wire is wire and insulators and cross-arms and pins are always that and a switchboard is usually just a switchboard, plus or minus. And so is a flour mill. The *American Miller*, Chicago, is a very old journal to the milling trade. For years and years it carried a page regularly and sometimes more, of a pioneer concern manufacturing flour milling machinery. Finally, a cancellation came. It was a long hike to Binghamton, but away they went to get the customer back. They found that the father had turned the works over to Henry, just from college. Henry reasoned: "Everybody knows us. Grandpap slipped this works to father and now I get it. Why, everybody knows all about us." The *American Miller* gave it up after a long struggle and while they couldn't agree with Henry, neither could they change his view. Henry argued that the *American Miller* had never sold a mill and the publishers knew of no specific case where they had. Five years is a long stretch to lose an advertiser in the big class, but five years later, Henry came on to Chicago and called at the office of the *American Miller*. He was very courteous, invited the boys out to lunch and shocked them into insensibility by asking for a contract, which he promptly signed. Then he told how he had lost a hundred thousand dollar order because he had run into a young chap who knew all about everybody else's stuff and had never heard of his. This young buyer had been reading trade journals for four years and had never heard of Grandpap's famous works. Henry admitted the curtailment of advertising had saved him a few thousand dollars, but he would never get over his humiliation as a result of being an also-ran on the Kalamazoo job. It pays to stick along.

* * *

The publisher of a telephone trade journal has little opportunity to know how he is serving his customers. If he accepts advertising copy and gives it intelligent setting and display and delivers his magazine into the prospective buyers hands, he is pretty well through. The buying power per unit of his subscription clientele is very large. He can never know what that buyer is going to purchase. He is never surprised when he learns that the equipment included things from all his advertisers.

* * *

How many testimonial letters have you seen during

the past dozen years that sing the praises of a telephone trade journal as a result getter? We have had one. We made a zinc etching of the original letter and had some duplicates struck off, but before we could get them out the account was lost. We see by an esteemed contemporary that a non-advertiser got a whale of a lot of inquiries as an advertising result, but it doesn't explain what happened to the advertiser. He isn't there any more.

* * *

A little while ago we got an extremely bitter reply to our solicitation of a certain account. It was such hot stuff that we liked it and sailed back under full steam. This prospect cooled down after a time and we went to work with him. We gave him the cream of our subscription list—several thousand addresses we knew could buy if the advertiser had something they wanted. We told him to try it out *his* way, that we were no charity. We felt we couldn't get him results his way and told him so. We even ventured the guess that he couldn't land by his method. Here is how it worked out:

> We are in receipt of your letter of the 17th and in reply we sent out literature to every telephone company on the list you sent us. Up to this time we have never even received a single inquiry. It seems almost incredible, but it is a fact just the same.

The foregoing, however, only referred to Illinois. Our curiosity prompted another letter to this prospect, for we wanted to know how he came out on his bigger campaign with the second appeal. And here is what we drew:

> Replying to your favor of the 21st, nearly the same conditions exist in the balance of the country outside of Illinois, because out of about 8,000 circulars sent out, we did not receive more than a dozen orders and from the state of Illinois we did not receive a single one.

This should be conclusive that you can't make 'em buy, but it isn't argument that you shouldn't advertise. For the telephone buyer takes his own time to make up his mind. In the case of the larger exchange, these deliberations are sometimes protracted over a long period of years. The constant hammer of the big and little advertiser eventually gets in its work. Goods become standard because the house and its wares are known to be a part of the telephone industry. It would be a strange kit of linemans' tools that didn't disclose a Klein trademark!

* * *

The fly-by-night adventurer has no interest in the telephone business because it has no interest in him. You've got to belong! To belong, you should make up your mind at the start to hang up your sign and announce your stuff. If the line will warrant argument—and it must be a sorry lot of goods if it won't—then you should present that argument. Not in an issue or two, or a year or two; but right along. At convention time you are on the spot with a display and the silver-tongued enthusiast will call in the boys and show them the newest kink. Slow process, you say; but, my brother, it is the only way in the telephone field and it doesn't take a lot of dope to prove it.

* * *

There are individual buyers in the telephone field who can and do buy the complete product of large manufactories. This condition in itself denies the trade journal a number of accounts. It should be the best reason for competition in the same line, but it has never reached that point. Many of the large telephone manufacturers create from the raw stock every part that enters into their apparatus, thus curtailing the prospective advertising clientele of the journal to the trade. Taken by and large the telephone field is very limited for the publisher, but there are many concerns which enjoy a large annual business founded upon the industry, who never have and probably never will advertise. The electrical supply houses formerly advertised, but they have long since abandoned the practice. As a rule they handle telephone apparatus of the established manufacturer and their salesmen depend upon the brand to carry most of the argument. Jobbers' theory only.

* * *

But if you have something new that will stand the rigid inspection of the expert, exploiting that product will get inquiry. The telephone field isn't asleep because it fails to respond to the advertising. The advertisements in this issue of TELEPHONE ENGINEER will be read. The readers will know who is making wire and cable and pins and brackets and poles and cross-arms; who rebuilds telephones and who makes them outright; who will engineer the job. They will follow any improvement in equipment or what not. Advertising is essentially a prime factor in the trade journal and if it isn't as interesting as the text pages, maybe the ad men didn't work hard enough!

* * *

Only a comparatively short while ago, the automatic and semi-automatic telephone were new and untried-in-practice devices. We can all recall how the interest clung to the technical descriptions of these systems. Manual engineers were uniformly prejudiced. They saw no possibilities for the girlless instruments. Everything that has advanced the automatic systems must be charged to advertising, or rather to investment, for advertising is always contributory to the good will. Had the manufacturers of this type of equipment denied themselves the necessary publicity aids, the prejudices of manual experts would not have been upset, nor would this and foreign countries yell back the denial with their many plants.

* * *

The constant advertiser lends assurance to the prospective buyer. We have refused to accept the flyer advertisement of a small prospective customer because he expect to get his profit out of an advertisement or two. The telephone business isn't adapted to that sort of thing. It would be foolish to take that advertiser's money, because he would lose all confidence in all advertising. The telephone field, if it can adopt your particular thing, will take it on. Maybe not now, but when it can be made to wake up to the particular saving you offer. Telephone companies are slow-going institutions. They take hold of new things gingerly. They must be shown—not once, but time and again. And then they ponder some more.

* * *

To drop an advertisement for a month or two is small economy, when considered at the end of the year's business. We send out more advertising matter in dog days than at any other time of year in the sincere belief that the recipient has more time then to think about our proposition. He may not act then, but we find he does act later on. Men do not cease to think, even if it is hot.

* * *

So these are the wee little dog-days of our discontent. If we were to engage in the making of a product for the telephone buyer, we would dope our advertising expenditure for the year and have that job over. We would then utilize the space contracted for with the best

copy possible and we'd ride the publisher for three times as much space in his reading pages as we bought in the advertising section. No publisher of a telephone journal has ever called a halt on clean trade items. He needs them. His readers find interest in them. The trouble, as a rule, can be traced to the ad man who has steen thousand other distractions in his day's work. But we'd stick to the advertising according to a regular schedule and the reader would learn to understand that we were nudging him for an order. When he finally made up his mind to place the order, it wouldn't be hard for him to find our address. We wouldn't be taking stock or going fishing the day he looked for us.

New Rates Around New York

A general revision of telephone rates in and around New York, designed to establish more uniformity between rates and distances, particularly for suburbs, is announced by the New York Telephone Company. The new schedule goes into effect July 1, and is filed by the company with the Public Service Commission of the Second District, and with the Board of Utility Commissioners of New Jersey. With the announcement of the new rates the following statement was given out by the company:

The new schedule effective July 1, provides consistent and uniform rates for uniform distances. In general, the rates are based on the air line distance between toll points, and this method of computation has been followed with exception of a few instances where some great natural barriers intervene, such as great bodies of water or continuous mountains which it might be necessary to build our lines around rather than across.

Based upon the present volume of traffic, the new rates applying over the entire territory of the company will result in a saving of telephone toll users of more than $650,000 per year.

The new rates to suburban toll points around New York City will be shown in the telephone directories, the delivery of which to New York subscribers will begin on Monday, June 9. It should be borne in mind, however, that these new rates do not take effect until July 1. The subscribers will also be notified on July 1 of the change in the rates by means of an announcement mailed with their telephone bills.

Coincident with the introduction of the new schedule rates a new system of charging for overtime on toll connections will be introduced. The charges for a toll call are based upon a five minute communication, and heretofore it has been customary to charge fractions of five minutes overtime as an additional call. For instance, seven minutes would be charged as two calls, twelve minutes as three calls, etc. Under the new system the charge for overtime will be graded according to the actual number of minutes of the connection and rates have been so adjusted in the new schedules.

With the improvements that have been made in telephone plant and operating methods, a toll call or a "suburban call," as it is known here, is handled practically by the same methods and almost as quickly as a local call. Good telephone service adds much to the attractiveness of life in the suburbs and the telephone as well as the rapid transportation systems has had much to do with the extension of the suburban commuting area around New York during the past ten years. Large sums of money have been expended on the toll lines during the past year and many improvements have been made.

Detroit System Being Improved

The Michigan State Telephone Company is pushing the work of renovating the consolidated telephone property in Detroit with energy now that weather conditions have become fairly well settled, and will spend a large sum in rebuilding the system in various portions of the city.

In the Walnut office district, embracing the attractive residence section in the northwestern part of the city, about $18,000 will be spent in combining lines and creating facilities for new business. Nearly a mile of underground conduit will be laid in this district, with capacity for four large cables that will serve 5,000 telephones. The route will follow McGraw and Lawton avenues.

Where the company has now open-wire, pole installations, the combination of the two systems will give much business that calls for aerial cables. Aerial cables now serve where the underground cables are to be laid. These three types of transmission are used as business warrants and the consolidation makes it necessary to install the cables, either aerial or underground, in various portions of the city.

More than 1,000 miles of wire in cable will be installed in the new work in the Walnut district alone, and about 200 miles of open, or poled wires, will be removed, thus aiding in giving the district an improved appearance by the absence of street poles.

New Jersey Commission News

The New Jersey Board of Public Utilities has refused approval of an ordinance granted to the Eastern Telephone & Telegraph Company by the Board of Freeholders of Cape May county, and the Borough of Avalon. The Delaware & Atlantic Telegraph & Telephone Company (Bell system), now operates in this territory. Assuming jurisdiction to withhold its approval of the ordinance, the board reaches the conclusion that as a general proposition competitive telephone service is not necessary and proper for the public convenience, and does not properly conserve the public interests.

The board has dismissed the petition of the Farmers' Union Telephone Company of Sussex county for a determination as to the necessity for the formation of the Farmers' Mutual Telephone Company, a competitive organization, holding that a purely mutual telephone association is not a public utility within the meaning of the act of 1911, and therefore, not under its jurisdiction. The Mutual company was organized following the increase of rates by the Union Company, to operate in the same territory. The Union Company then appealed to the board to restrain the Mutual organization from such operation, upon the ground that it would prove a public detriment.

Idaho Commission News

Telephone and telegraph companies in Idaho must discontinue all irregular and discriminatory exchange rates charged. This is in effect the order laid down by the Idaho Commission. The order has the sanction of President John A. Blomquist of the commission and Commissioners Ramstedt and Stanrod. It was issued in compliance to a request from the Pacific Telephone & Telegraph Company of San Francisco, which also asked that standard rates apply to all subscribers of that line in effect Jan. 2, 1913. The latter application is dismissed. The order containing the ruling is the longest so far issued by the commission.

Wisconsin Commission News

The Wisconsin Railway Commission directed the Ettrick Telephone Company, and the La Crosse Telephone Company to make a physical connection of their lines, so that the subscribers of both may communicate.

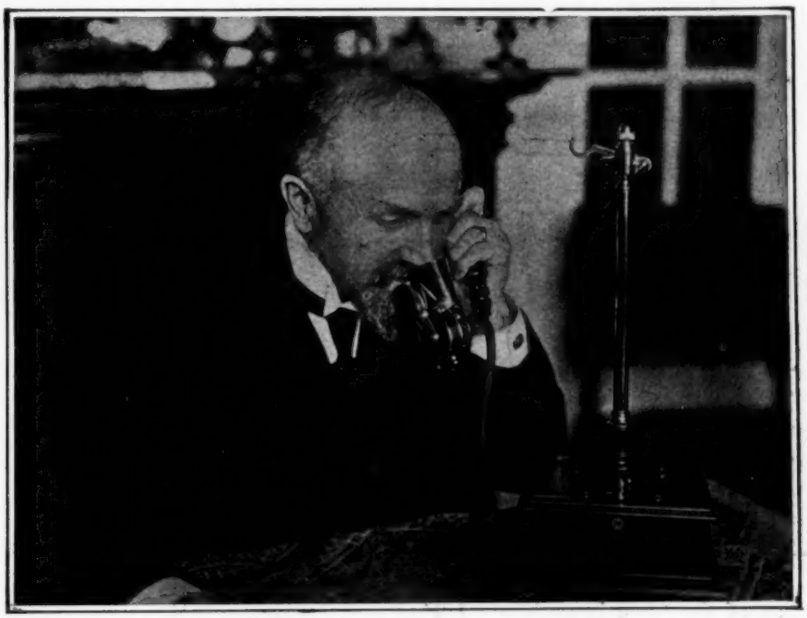
Upon complaint of E. W. Johnson and other residents of Lodi, the commission has ordered an improvement of service for patrons of the telephone company. Poor service, due to overloading of lines, was alleged.

The Telephone Scrap Book

An Intensifier for Telephone Transmission

THERE is something artificial about our present method of speaking over the telephone, says Jacques Boyer in the *Scientific American*. The mouthpiece is so constructed that it gathers only those sounds which proceed directly from the mouth, whereas in actual speech, a not inconsiderable portion of the sounds emitted are carried more or less completely through the nose. All such sounds must be almost completely lost in an ordinary telephone conversation, and we can therefore not be surprised if the voice carried over the wires, although recognizable to one accustomed to the instrument, nevertheless differs materially from that of ordinary speech.

Hitherto telephone engineers, in attacking the problem of increasing the distinctness of transmission of the voice over the telephone, have mainly concentrated their attention upon improvements in the construction of the microphone, or else upon improvements to the design of the telephone line. No one, until recently, seems to have paid much attention to the study of the human voice and its peculiarities with a view to applying the observations thus obtained for perfecting telephony. It is by starting from such a basis as this that Dr. Jules Glover has evolved an apparatus shown in our illustration, by the aid of which the sound carried over the wire is much intensified and the clearness of speech is greatly increased, a matter which is of no small importance, especially for long distance transmission.



Dr. Glover Using His Transmitter with Nose-Piece Attachment.

Inasmuch as in the telephone the electric current reacts upon the magnet in the receiver, not so much by its intensity, but by the variations in its intensity, it is necessary, if the ear is to receive as perfect as possible a rendering of the sound impressed upon the transmitter; to reproduce as exactly as possible all the modulations of the voice. To realize just what this implies, we must bear in mind the construction of our throat. On issuing from the pharynx the sound waves impinge upon the soft palate, which divides them into two unequal parts, of which the one escapes through the nose, while the other issues at the mouth (see our illustration). Evidently to obtain a perfect result, it is necessary that each of these two groups of sound waves be transmitted in proper proportion over the telephone, while as a matter of fact, the instruments in common use transmit almost exclusively the mouth waves, so that nearly one-half of the voice remains unutilized. This is not a mere guess, but can be actually proved experimentally by recording by photographic means the variations in the intensity of the microphone current, which can be done by the aid of an oscillograph; a simpler means to effect the same end, perhaps less perfectly, is to observe the condensations of the breath from the mouth and nose by means of mirrors or other suitable devices. It is found that the records so obtained for the mouth and nose differ for the same word, according to loudness of speech.

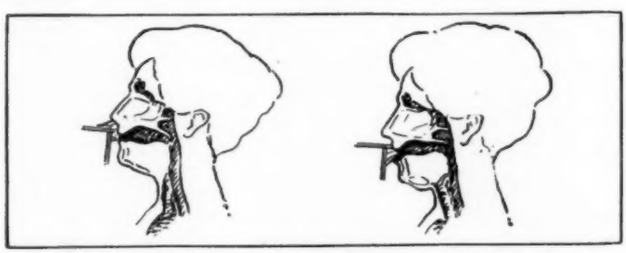


Diagram showing the action of the soft palate in directing a part of the breath in speech through the nasal passages (figure on left) or closing off these passages and directing the entire stream out through the mouth (as shown on right). Two mirrors placed, one under the nose, the other before the mouth, catch the breath and thereby indicate the relative strength of the two streams.

In the improved telephone invented by Dr. Glover, contrary to the usual custom, the entire voice assists in producing the electro-magnetic phenomena by the aid of which speech is transmitted. The new apparatus differs from the customary form in that it possesses two microphone transmitters, one for the mouth and one for the nose, each of properly adjusted sensibility. The couple of mouthpieces are attached to a handle as in the ordinary telephone.

Microphones of this kind can be used directly in the primary without conversation battery and without induction coil. The apparatus functions perfectly by the use of a single central battery, giving 24 volts or less. The uniform resistance has a total of 150 ohms, which, however, can be adjusted to suit circumstances. The induction coil can be omitted as the variations in the intensity of the current due to the voice are found to be sufficiently accentuated without it. Nevertheless, transmission is somewhat assisted by the use of the coil.

As a matter of hygiene, a roll of tissue paper may

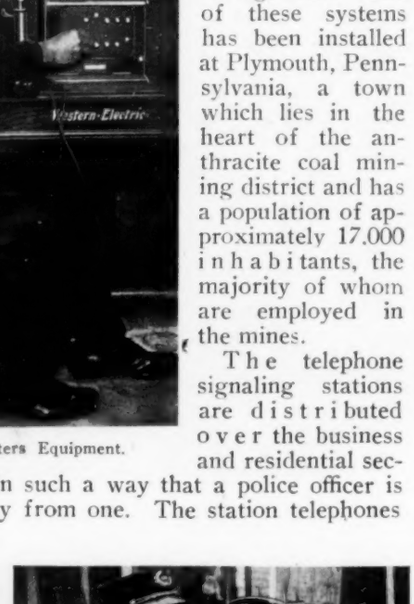
be passed in front of the mouth and nose to prevent any possible infection, the tissue paper being renewed automatically at each call.

Police Signaling by Telephone

POLICE signaling systems, in which the telephone furnishes the means for communication between signal station and police headquarters, are coming more and more into universal favor as a reliable means of maintaining a check upon the movements of the police officers and summoning aid in emergencies. One of these systems has been installed at Plymouth, Pennsylvania, a town which lies in the heart of the anthracite coal mining district and has a population of approximately 17,000 inhabitants, the majority of whom are employed in the mines.

The Police Headquarters Equipment.

The telephone signaling stations are distributed over the business and residential sections of the town in such a way that a police officer is never very far away from one. The station telephones are of the familiar iron box type and are fastened either to the walls of buildings or to telephone poles. This type of telephone, with its heavy double iron door construction and moisture-proof apparatus and metal parts, is especially adapted to severe out-of-door service. The outer door of each telephone is kept locked and can only be opened by those authorized to carry keys—the members of the police department and the township authorities. The opening of the outer door exposes only the talking apparatus. When both doors are closed, the telephones are moisture and dust proof.



Police Telephone Signaling Station, Showing Officer Making Report.

The signaling system is operated from a central battery at police headquarters. The line wires from the telephone station boxes are connected at headquarters to a cordless private branch exchange switchboard. This type of switchboard is very compact and small enough to be mounted on a desk as has been done in this instance. On account of the small amount of space which it occupies, the operator, who in this case is one of the uniform forces, can also attend to clerical duties.

A novel feature of the equipment is the manner in which calls are recorded. The incoming calls are recorded on a Bristol recorder, which is located directly over, and connected to, the switchboard. At the headquarters switchboard there are a number of resistances, no two of which are alike in value. One of these resistances is connected in the circuit of each police telephone box, so that the amount of current supplied to each telephone differs from that supplied to the others. The amount of current required for each of the signal boxes is a fixed known quantity. When the record is made on the Bristol instrument, the amount of current flowing is indicated on the sheet and shows which station has called. The sheets of the recorder give a permanent record of the calls made from each of the telephone stations, and in this way the movements of the police officers may be checked.

The simplicity of the system, which was furnished by the Western Electric Company and installed by the Dungan Engineering Company of Wilkes-Barre, Pennsylvania, is a great factor in its satisfactory operation. It has also been found that the system has produced a higher degree of efficiency in the police department, as a result of the increased facilities for supervision.

Study of Resistance of Carbon Contacts

WHILE engaged in some experimental work with telephone transmitters it was found that the resistance of carbon contacts varied to a remarkable extent, not only with pressure and current, but also with the time and in a very regular manner, says A. L. Clark in the *Physical Review*. The first two effects have been known for a long time, but the regular variation with time after eliminating the effect of change due to a rise of temperature seems to have escaped notice—at least, I have been unable to find any account of such work. To be sure, it has been well known for a long time in telephone practice that oxidation and breaking down of contacts occur, but no attempts to show any regularity in such phenomena have been discovered. The effects of pressure on contact resistance of carbon was investigated very thoroughly by Bidwell, who also investigated the effects of current strength on contact resistance. He found that the passage of a current through the contact caused the permanent change in resistance, sometimes decreasing it and sometimes increasing it, depending on the value of the current. In this connection, he found that if the current does not exceed a certain value, the resistance is decreased, and more as the current is larger, provided the current does not rise above this value. On the other hand, if the current exceeds a certain value there is a permanent increase in the resistance.

It will be convenient to divide carbon contacts into two classes—loose and tight. By a loose contact is meant one where the particles are held so that the contact is made under very slight pressure. In this case there is no

change of resistance due to expansion, which usually causes increased pressure; but the contact may break down, as will be seen below. By tight contact is meant one where the particles are held with sufficient firmness to maintain electrical contact even with large currents. In the first case—that is, loose contact—there are noticeable permanent changes in resistance. In the latter—tight contact—these changes are very slight. Microphonic action is not impossible in the case of tight contact. Indeed, the microphone is usually an example of tight contact in the sense explained above.

Loose contact was studied first by attaching a small carbon ball or a small grain of carbon to a thin phosphor-bronze wire with a bit of a liquid cement, containing graphite and known as "clamp paste." This hardens in a few hours, is very strong and conducts well enough. In other experiments the carbon balls and fragments were partially coated with copper electrolytically and then soldered to the phosphor-bronze wire. Any other small wire possessing considerable elasticity would do equally well, but the phosphor-bronze wire was at hand and served very nicely. The method of attaching the wire to the fragment seems to have no effect on the result. The wire was about 5 cm. long, and was held by its end in a clamp so that the bit of carbon could be moved to touch another rigidly held piece of carbon. The circuit is shown in Fig. 1. A 4-volt storage battery is arranged to send its current through a potentiometer wire, *cd*, and an adjustable resistance, *R*, in series. A sensitive voltmeter is applied at the ends of the wire *cd*. The variable contacts *a* and *b* lead the current through a milammeter and the experimental carbon contact in series. The milammeter should be as near dead beat as possible. By moving *a* and *b* any required voltage may be applied and the current observed. It was found that when a small current is sent through the contact that there is a very regular decrease in resistance, which, if the contact is undisturbed, seems to be permanent. The slightest jar, even that made by a wagon passing in the street outside, is sufficient to change the contact in such a way that the phenomenon repeats. Table I. shows the result of several successive runs, beginning with a low e.m.f. and increasing to a value below the critical point. It will be seen that after the first run the resistance changes very little.

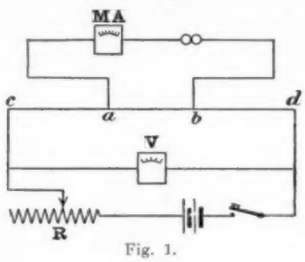


Fig. 1.

TABLE I.

E. M. F. in volts.	I.	II.	III.	IV.
0.4	445	308	296	296
0.6	383	289	287	277
0.8	254	222	236	236

If, as Bidwell points out, the e.m.f. passes a certain critical value, the phenomenon changes. There the resistance increases with the time and with remarkable regularity. As Bidwell noticed, the critical value depends somewhat on the pressure at contact. It also depends on contact area, so that the critical value probably depends on current-density rather than on e.m.f. The higher the applied e.m.f., or, better, the higher the current-density, the more rapid is the rise in resistance. Fig. 2 shows the phenomenon for two balls in loose contact when the applied e.m.f. is 1.6 volts. As will be seen, the resistance increases rapidly at first, then more slowly, and after about two minutes has increased to five-fold the original value. There is no evidence of recovery in this case. If the current be interrupted at any time, and the circuit be left open for an hour or two and then closed, the resistance begins with the same value as when the current was interrupted, and the curve is absolutely continuous, unless the contact has been jarred. With large e.m.f.s, but still so small that no visible arc forms, the resistance rises rapidly to infinity.

With smaller e.m.f.s the change is very slow. If the initial value of the e.m.f. is near the critical value, it

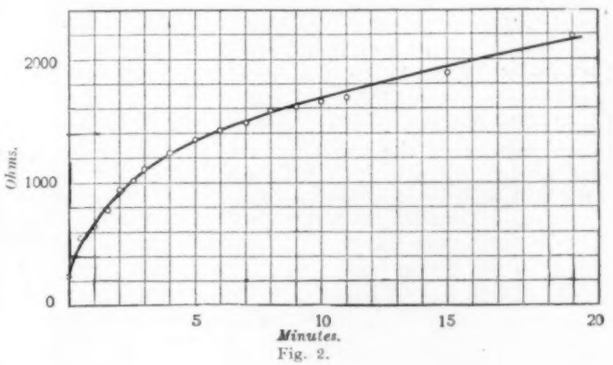


Fig. 2.

may happen that when the current is turned on the resistance falls for a moment, then rises. Apparently the fall in resistance gives rise to a current-density in excess of the critical value, and the second case is exhibited. Occasionally the resistance falls very quickly to a very low value, and the contact then shows signs of cohesion, requiring a slight but unmistakable pull to separate the particles. On the other hand, when the phenomenon of increase of resistance is observed, and the particles are observed under a high power microscope, traces of a feathery adhering substance are sometimes seen, suggesting ash. This is not always visible, and where seen may be small fragments abraded by rubbing, but the existence of ash is suggested. Table II. shows the effect of successive passage of the e.m.f. beyond the critical value. Each such passage gives rise to an increase of resistance. In this experiment the circuit was closed for as brief a period as possible. The longer the circuit is closed on the high value of the e.m.f. the higher the next curve of the family will rise.

TABLE II.

E. M. F.	I.	II.	III.	IV.	V.
0.4	313	413	523	712	988
0.6	290	382	462	635	808
0.8	267	342	425	533	684
1.0	243	307	380	463	592
1.2	223	282	340	411	504
1.4	212	258	294	362	445
1.6	186	229	274	309	385

The phenomena observed are totally different when the pressure becomes great enough to break through the non-conducting layer, whatever it is. For example, a ball was held against a vertical disc of carbon with pressure produced by the elasticity of the phosphor-bronze wire, and the phenomena of loose contact were observed. It was then placed on the same disc held horizontally, the pressure now being caused by the weight of the ball, and the contact was tight. When the contact is tight there is no breakdown, even when the current is large enough to cause a bright arc. In another experiment

two thick carbon discs were placed near together in the same vertical plane, and a small fragment of carbon dropped between them. Such a contact may be loose or tight, behaving very erratically.

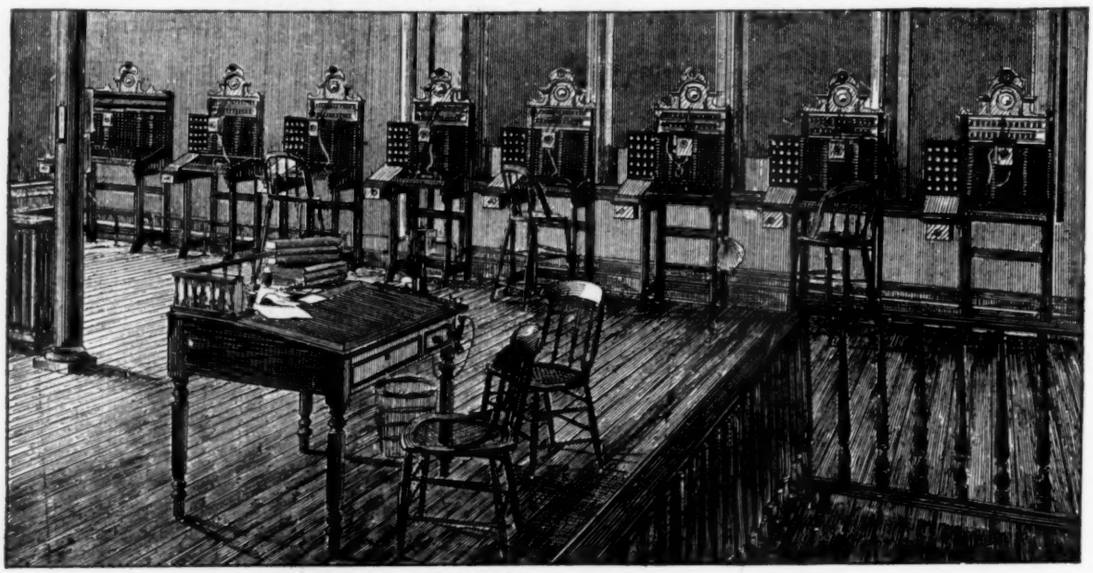
Providence Exchange Thirty Years Ago

FROM its own pages of thirty years ago the *Electrical Review and Western Electrician* quotes as follows:

The operating room of the Providence telephone exchange, one side of which we illustrate herewith, we have thought it important and interesting to our readers to illustrate. The number of telephones rented April 1, 1883, in all of the company's exchanges was 2,480, and in Providence, 1,725. The increase of the present year [1883] bids fair to continue at the rate of about 100 per month. The principal office is in Providence City. The operating room of the Providence main office was enlarged and refitted in the summer of 1881, and an entirely novel system of making connections between the switchboards adopted, the peculiar features of which are throwing a portion of the work upon the subscribers by, in most cases, obliging them to give their order twice, doing away with all communication between operators or the necessity of message boys around the room; which system has worked very satisfactorily, as may be judged from the fact that it has not been found necessary to modify it in any way with an increase of the number of subscribers from nine hundred, the number at the time the system was adopted, to about seventeen hundred, in the same room, which is the number the present day. One important peculiarity is that the central-office telephones are invariably looped into the lines under all circumstances, so that no interference is given to the parties conversing if the central office connects into the circuit for any purpose whatever. In the rapid increase of long-distance telephoning, this is a very essential feature, and one which will undoubtedly be found indispensable in every large telephone exchange.

Young ladies are employed in the operating rooms, which are provided with many novelties contributing to the comfort of the operators, and speed in making connections from switch to switch. A retiring room, to be used during meal hours, etc., leads from the operating room of the main office, which is furnished elegantly, and adorned with fine pictures and flowers..

It is interesting to know that today, thirty years after this description was written, the Providence exchange has 44,000 subscribers.



Providence (R. I.) Telephone Exchange in 1883—View of One Side.

Physical Connection Case in North Dakota

The complaint of the Berthold Farmers' Telephone Company has been withdrawn from the North Dakota Board of Railroad Commissioners, and a new complaint filed by a citizen of Berthold, praying that the commission compel the Farmers and Northern Telephone Companies to make physical connection at Berthold. This action is similar to the one brought before the Wisconsin Railroad Commission by a citizen of La Crosse, which has attracted a great deal of attention from telephone people, and was decided in favor of the complainant, compelling physical connection to be made by the Bell and La Crosse companies. The various telephone managers of North Dakota have taken note of the Berthold case and when it comes to a hearing at Minot, the outcome will be awaited with considerable interest by the companies and the people generally, the issue at stake being whether a public utility company can be compelled to give the fullest service possible, whether it cares to or not.

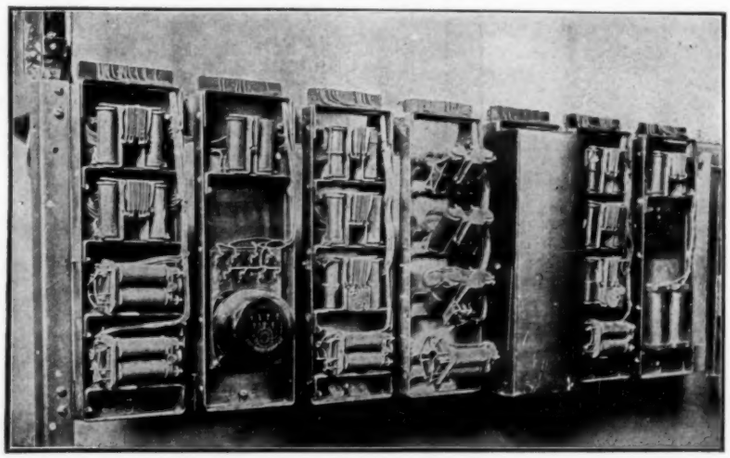
Mitchell, S. D., Votes to Own Telephones

The city of Mitchell, S. D., has voted for the issuance of $60,000 worth of bonds for the erection of a municipal telephone exchange, a total of 1,035 votes being cast, 775 for and 260 against the proposition giving the bond issue and Mayor Hitchcock a victory by 515 votes. President Zietlow of the Dakota Central Telephone Company, has made the statement that the bond election was held more to serve as a club over his company and he proposes to resist the establishment of a municipal exchange. He says that before he will permit the city to grant another concession he will remove his exchange from the city.

Automatic Methods in Long Distance

By H. M. Friendly and A. E. Burns*

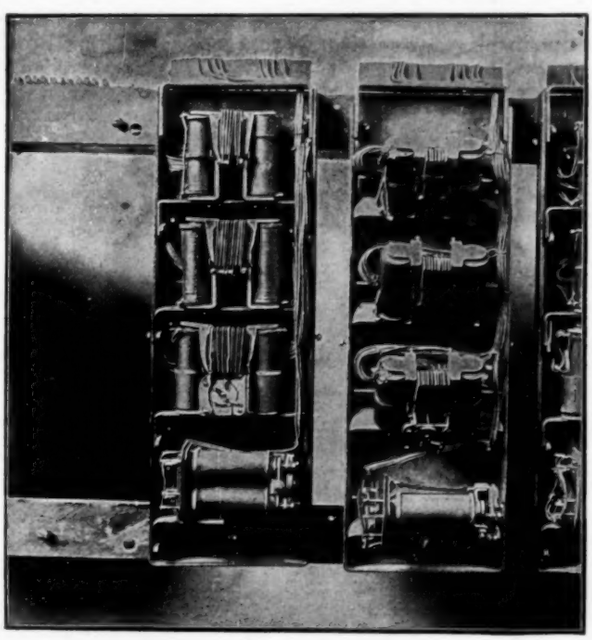
IN designing the equipment used by the Northwestern Long Distance Telephone Company, operating a toll system connecting independent local telephone exchanges in western Oregon and western Washington, the first consideration was to improve the traffic capacity of operators, lines and equipment. Incidental to this was the desire to render the work of the operator more mechanical, so that the personal equation would be eliminated as far as possible in the handling of switching equipment. To this end, somewhat radical and seemingly complicated electrical circuits were resorted to in accomplishing complete, positive lamp supervision, and in meeting various traffic requirements and expedients, but as long as such departures from common practice meant simpler operating, more rapid switching, or increased transmission efficiency, all consistent with reliability and normal maintenance, the means were considered as fully justified.



View of portion of Rack, showing Apparatus Sets. No. 4 has relays tilted out for inspection. No. 5 is set with dust-proof cover in place.

The fact that the Northwestern Long Distance Telephone Company has no direct authority over its connecting companies, the inability to exercise discipline and strict traffic rules over foreign operators had to be taken into consideration, and every possible step employed to improve and quicken the service in order to counteract this deficiency, competition for business being very keen.

As will be observed, the equipment on the toll switchboards proper is free from special, irregula or compl-i cated devices that require great care and special instruction for proper operation—the circuits are uniform at all operators' positions—the minimum of apparatus subject to adjustment is employed in the switchboard; such apparatus, wired in sets, being placed in the wire chief's room, or in any other place where it may be convenient for inspection and repairs, without in any way interfering with or annoying operators at work. Further, the apparatus sets have been mounted in detachable units, thus allowing a complete change of the character or type of equipment associated with any line without altering or mutilating wiring in the apparatus set. Each detachable apparatus set consists of a frame 1/8 by 3/4 by 3/4 inches angle iron, bent to form three sides of a rectangle 5 by 16 inches, the top being left open. A piece of 24 gage sheet iron is riveted to the back to form a dust-proof, induction-proof case, and a close fitting sheet iron detachable cover is provided for the front, it being found that where the apparatus sets are mounted close together (6-inch centers) without cross-talk protection, when relays of one set were being operated, induced clicking noises could be heard on the lines associated with the nearby apparatus sets. The top of each apparatus set frame is closed by a piece of the same angle iron, bent and pivoted to form a sort of rocking switch carrying eleven insulated points used as terminals; these points designed to engage with insulated companion springs or clips on the stationary rack; the latter made of 3/16 by 2 by 2-inch angle iron. All external wires are brought to the rack springs permanently; thus to remove an apparatus set, and substitute another, it is only necessary to disengage the clips, unhook the set from the rack, place the desired set on the rack and tilt the rocking switch so its points engage their companion rack springs. All wiring of the sets is brought out to the rocking switch, the wiring having extra heavy braided insulation, and so disposed loosely in the set that it is not injured by the small hinge movement of the rocking switch in cutting the set in or out of service. The detachable feature of the apparatus sets allows such equipment at distant offices to be removed and sent to the shop for repairs or alterations in specially designed shipping boxes, avoiding the necessity of send-



View of Two Apparatus Sets. Set to the left has been removed to show springs at top of rack which engage with points of the rocking switch at top of set.

* Paper presented at the 30th annual convention of the American Institute of Electrical Engineers, Cooperstown, N. Y., June 24, 1913.

ing out a high-priced man and paying the incidental cost of transportation, etc. The expense of one such trip alone to some of the distant offices would more than pay the cost of a duplicate set to be kept for such emergencies. An operator, or any inexperienced person, can easily effect a change of sets, place the displaced set in the special box and express it to the shop.

The relays used in the apparatus sets are mostly of

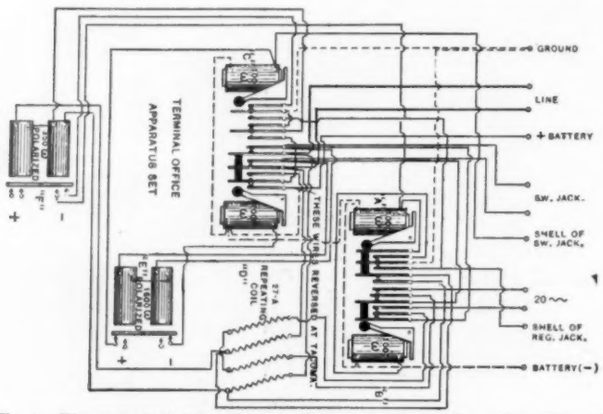


Fig 1—Through Switching Circuit—Two-way—Ring-back. (See Fig. 2)

the automatic vertical type. This type was chosen because of its adaptability; almost any circuit combination desired being possible by merely assembling the proper springs and insulating bushings. The contacts can be given any reasonable degree of tension or pressure, and the slight sliding movement due to construction tends to keep the contact surfaces bright and free from dust. The margin of adjustment in this type of relay is also very wide, and all parts are easy of access for inspection and maintenance. These relays are mounted upon angle-iron shelves, pivoted in the apparatus set frame in a manner similar to the switch at the top, allowing all the wiring and relays to be tilted out, inspected and repaired without removing them or mutilating the wiring. A gravity-catch locks the relay mount in place when tilted back into normal position. The repeating coils, retardation coils, condensers, etc., associated with the apparatus sets are mounted on the back thereof, since there are no moving parts to inspect or adjust.

Another type of relay that has proved its usefulness and reliability is a polarized relay designed expressly, on the plan of a polarized ringer, and which is compact and extremely sensitive, though capable of withstanding abnormal currents without impairing its adjustment—such as 20-cycle ringing power. This relay is also mounted as a part of the apparatus set, on a pivoted shelf, when the equipment comprises such a relay.

The apparatus sets are secured to the rack by slots which slip over the heads of round-head machine screws on the rack angle iron, the slots being enlarged at the bottom to take the heads of the screws.

One of the first conditions to be surmounted was in the territory between Portland and Tacoma, a distance of 145 miles. From Portland north to Centralia, a distance of 95 miles, is a No. 10 B. & S. copper circuit, used as a way-line on which are ten stations and offices, each with a 1,600-ohm signal (switchboard drops and bells having the same type of movement) having a two microfarad condenser in series therewith (this latter provision is carried throughout the entire system to facilitate line testing and fault location). From Chehalis, 4 miles south of Centralia, to Tacoma, a distance of 50 miles, is a similar way-line on which are ten stations. Thus the way-lines lap for a distance of 4 miles between Centralia and Chehalis. This lapping was done since these towns are the largest between Portland and Tacoma, and incidentally are about equal in importance from a traffic standpoint from both directions. The lapping of the circuits obviates delays such as would ensue if intermediate switching had to be resorted to. For normal switching between Portland and Tacoma, and Portland and Seattle, the latter 40 miles north of Tacoma, through trunk lines were provided. However, it is often desired to press into requisition the two way-lines above mentioned for Portland-Tacoma traffic. Any intermediate traffic is handled over these way-lines, excepting rush calls when the way-lines are busy. Two No. 10 B. & S. copper way-lines are provided in addition to the above, between Portland and Castlerock, a distance of 62 miles north. These lines are equipped for calling direct into the local automatic exchange at Portland; the methods used will be explained further on.

Delays in the establishing of, and in the taking down of switching connetions manually at Centralia or Chehalis for such through traffic le dto the equipment of the way-lines for performing this function of interconnection and disconnection remotely, from either Portland or Tacoma under the instant automatic control of the operators—day or night. The electrical circuit accomplishing this is shown in Figs. 1 and 2, and later described. The operating specifications of the through switching circuit are as follows:

The lines are normally used as way-lines without any restrictions whatsoever. Assuming that Portland desires to communicate with Tacoma—bear in mind that the switching and line equipment at both Portland and Tacoma is identical (excepting that battery on relay *D*, Fig. 1, is reversed at Tacoma as indicated in the diagram) and similarly operated and that the equipment at Centralia for effecting the interconnection (obviously this equipment could have been installed at Chehalis, or even on a pole between the towns, with the same effect) is actuated from either Portland or Tacoma—first the Portland operator ascertains if the Portland-Centralia line is busy by listening in on the line. If not busy, the operator

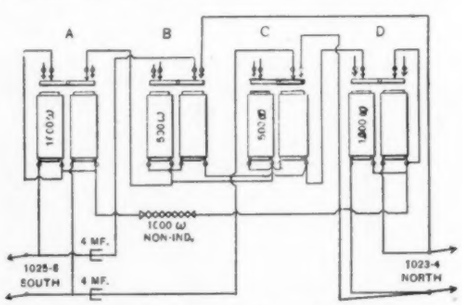


Fig. 2—Through Switching Circuit, Centralia, Wash. (See Fig. 1)

withdraws the plug from the regular jack and inserts it into the jack following, which may be called the through switching jack; over the latter jack is a number designating the remote line. Inserting the plug into the through switching jack causes the equipment at Centralia to be actuated, connecting the lines together, so that the Portland operator by listening in can instantly know if the remote line is idle, and that without any disturbance to possible users on the remote line. If the remote

line is found idle, the Portland operator rings Tacoma's signal, or the signal of any office on the remote line, in the usual way with her regular cord ringing keys no special keys or devices being employed. Since no bell on the near line rings from the through switching jack, the same code of signals has been used on the near and remote lines so far as was found convenient. Incidentally, the signal showing at Tacoma in the above instance is above the through switching jack, indicating that the signal comes from Portland. The object of this will be shown later. If an intermediate office on the near line desires Tacoma for instance, such office rings Portland in the usual way and requests Tacoma. The Portland operator, acting as a through operator, removes her plug from the regular jack and inserts it into the adjacent through switching jack, and if the remote line is found idle, signals as above. As no ringing impulses are projected on the near end, from the through switching jack, an operator listening in at the intermediate office hears no disturbance. When Tacoma answers the signal corresponding to her through switching jack, the Portland operator can leave the line at once, as Tacoma's plug

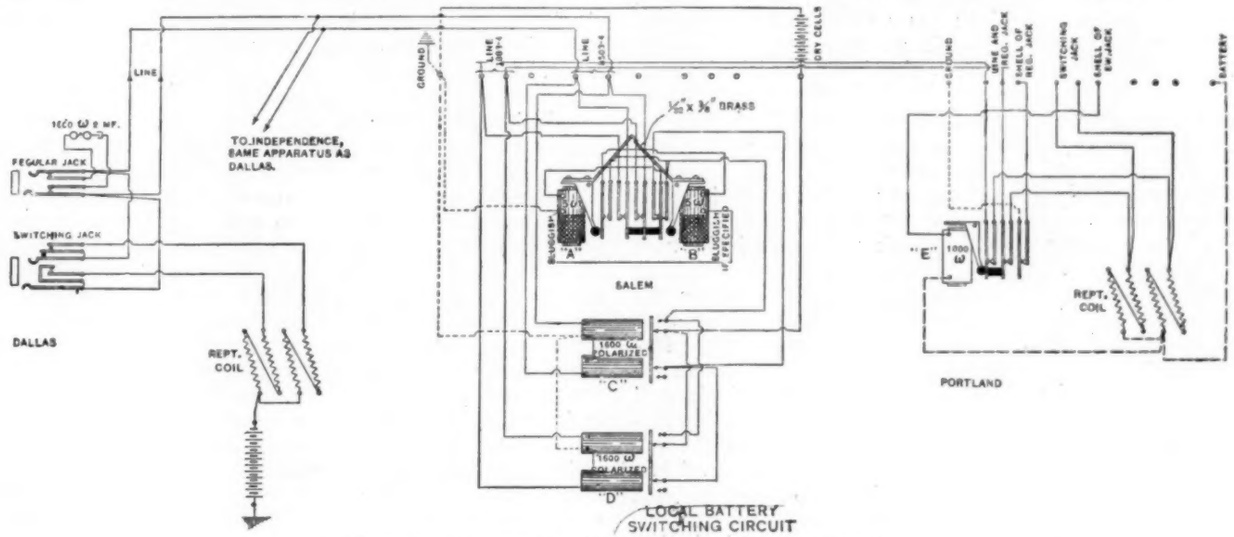


Fig 3—Local Battery Through Switching Circuit (See Fig. 10)

being in the through switching jack, maintains the through connection. If the call cannot be completed at once. Tacoma signals the calling office over her through switching jack when ready; Portland pays no further attention to the call, and makes no note of it, since Tacoma is a checking office. If, however, an intermediate office on the remote line is desired, the Portland operator supervises and checks the call as if it were a through switch made manually at Portland, which from an operating standpoint, it is. Tacoma in the latter instance would ignore all signals for intermediate stations coming in on the signal associated with her through switching jack, knowing that Portland, a checking office, is supervising such switches, although Tacoma checks all signals for intermediate stations coming in on the regular line signal.

The electrical details are as follows:

1. The Portland operator plugs into the through switching jack, projecting battery out on the line and operating the relay at Centralia, cutting the lines together.

2. The operator rings on the through switching jack which operates a relay in the apparatus set that reverses the battery projected out on the line. This reversed battery operates a polarized relay at Tacoma, and throws 20-cycle ringing power back on the remote line, the relay at Centralia simultaneously breaking the line connection during the time the current is reversed.

3. When the ringing key is released, the current is restored to the original direction, the relay at Centralia operates, and the through talking circuit is re-established.

4. When the call is completed the operator withdraws her plug, and the lines are restored to their normally separate condition as far as speech is concerned.

Referring to Fig 1 at the top of which are shown the eleven insulated terminal points carried by the rocking switch at the top of the apparatus set. The companion springs at the top of the rack are connected as shown: No. 1 to main ground; No. 2 and No. 3 to the two wires extending to the line and to the spring jack and drop associated with the line. No. 4 is connected to a set of batteries, in this case dry cells having the negative or zinc pole grounded; No. 5 and No. 6 are connected to the through switching jack and associated signal; No. 7 with the shell or "relay wire" of the through switching jack; No. 8 and No. 9 to 20-cycle ringing power; No. 10 to the shell of the regular line jack; and No. 11 to the main storage battery having the positive pole grounded.

Tracing a particular call, say from Kelso on the Portland way-line to Yelm on the Tacoma way-line, and knowing the modus operandi of the call from the preceding paragraphs, we can follow the action of the relays shown in Figs 1 and 2. When Kelso rings, the Portland signal associated with the regular line jack is actuated, the jack and drop of the through switching line being unconnected. Portland answers by plugging into the regular line jack, ascertains that Yelm is wanted and changes the cord plug to the through switching jack. The third or shell wire of this plug is grounded, and engaging the shell wire of the through switching jack, throws a ground through point No. 7 of the apparatus set and actuates relays *C* and *D*, Fig. 1; also actuating the cut off relay associated with the through switching jack. Relay *D* connects the switching jack to the line, and in conjunction with relay *C* projects battery current to the center of relay *F*, where it divides and finds its way

through the coils of relay *F*, through two windings of the repeating coil to the line. Following the line to Fig 2 (Centralia) the battery current flows through the coils of relays *A*, *B*, and *C*, dividing again through the coils of relay *D* to reach the Tacoma way line. The apparatus set at Tacoma is identical with Fig. 1, except, as may be noted, that two of the wires are reversed on relay *D* so that the batteries at Portland and Tacoma will not be opposed when operators have cord plugs in their respective through switching jacks, and the current for ringing control is necessarily of the opposite polarity. Following the line to Fig. 1 again, this time at Tacoma the current can be traced through the repeating coils and the coils of relay *F* to ground, whence it returns to the battery at Portland. The current thus established flows on the line from Tacoma to Portland, and relays *B* and *C*, Fig. 2, are wired to operate with this direction of current, connecting the two way lines together through two four-microfarad condensers. Relay *F* at Tacoma operates to the minus side, and thus produces no effect. When Portland rings relay *E*, which is bridged across the line, vibrates and thus keeps the contacts practically wide open, the period of contact being of short duration. This allows relay *D*, which has a strong tension, to fall back, and tracing the circuit as before, with relay *C* actuated and relay *D* normal, plus battery currents from point No. 4 of the rocking switch is finding its way to the line and through the sets at Centralia and Tacoma as before, but this time the current flows in the reverse direction, from Portland, to Tacoma, actuating relays *B* and *C* at Centralia in the plus direction and breaking the talking connection. Relay *F* at Tacoma is also actuated in the plus direction and actuates relay *A* which in its turn actuates relay *B*. Relay *B* impresses 20-cycle ringing power on the through switching jack, and actuates the associated line signal, apprising the Tacoma operator that Portland is ringing, and not some intermediate station, the regular line signal not being actuated since relay *A* grounds the shell of the regular line jack, and operates the cut-off relay associated with this jack. Relay *B* also impresses 20-cycle ringing power on the primary winding of the repeating coil, and as relay *A* has short-circuited the inner lugs of the secondary winding, 20-cycle ungrounded ringing power is thus projected out on the line. This is important, as the normal ringing power is grounded on one side, and if thrown directly on the line would shunt out a large portion of the operating current, while the alternating current from the live side of the ringing generator would return to ground through the relays of the set, vibrating them and thus breaking up the ringing impulses projected out on the line. Also, grounded ringing power or ringing power subject to grounds, from intermediate stations must be guarded against, otherwise the switching relays at Centralia would operate, cutting the lines together, interfering with service; while the relays at the terminals would operate the switchboard signals and also ring back on the line. This is prevented in two ways.

1. In Fig. 2, the line circuit is carried through the contacts of relays *A* and *B* before reaching the windings of relays *B* and *C*, the switching relays, and any ringing currents on the lines will open these contacts, preventing any ground leakage from operating *B* or *C*.

2. In Fig. 1, relay *A* operates with a ground from relay *F*, and the former in its turn operates relay *B*. The interval of time necessary to accomplish this being comparatively long, ringing impulses of any ordinary frequency will not endure long enough to complete the series of operations. It will be noted, however, that the intermittent ground from the contact of relay *F* is passed on from relay *A* to relay *B*. If the main ground were independently wired to the contacts of each relay it would have the opposite effect, that of producing a steady action of relay *B* by the intermittent action of relay *F*. Of course, this could be obviated as in composite telegraphy, by using a howler or high frequency ringer, or by the use of repeating coils at these stations, but this would increase the amount of equipment in the aggregate to more than is required in these sets to prevent the trouble. The endeavor has always been to keep unnecessary or avoidable equipment off the line at points where there is no competent man to maintain it. As used, the three apparatus sets can be disconnected from the lines if desired by pulling the switches at the top of each set, and not only will the normal operation of the lines be unaffected by the change, but no extra apparatus will be left on the line at any of these offices. Conversely, all of these apparatus sets may be regarded as supplementing the regular line equipment, and any facility they may afford in operating may be regarded as that much clear gain.

In the case of the above through switching circuit, ringing power is projected back from the opposite terminal office, since no ringing power is available at Centralia. If such ringing power were available, it could be used to ring in both directions under the control of the terminal offices in lieu of the methods used. The manipulation of the circuit would be the same in either case as far as the operators are concerned.

A condition in a way similar to the one first described between Portland and Tacoma existed between Portland and Dallas and Independence via Salem, the latter being 52 miles (83.6 kg.) (No. 10 B. & S. copper) south from Portland, and 15 miles (24 km.) (No. 10 B.w.g. iron) east from Dallas, Independence being on a leg from the latter line. The circuits (see Fig. 3) were somewhat modified by reason of the fact that, due to the small number of stations involved, and the short distance, it is found possible to ring through direct from any office on the line. In this circuit a means is provided at each switching station whereby the operator by plugging into the through switching jack causes battery current to be projected out by the line. This battery current serves to operate the through switching relays at Salem which connect the two lines together for talking. Ringing is done directly in the usual manner, and at the termination of the call the switch is released on the removal of the cord plug from the through switching jack. Two jacks are provided at both Dallas and Independence, (see Fig. 3) one the regular jack line, used for normal manual switching, and a through switching jack, provided with extra contacts for connecting the split retardation coil to the line. The center of this coil is connected to battery, the current following the line to Salem and operating the switching relays.

A similar action takes place at Portland where the retardation coil is connected to the line by means of relay *E*, which is operated from the shell of the through switching jack, projecting current on the line and operating the switching relays at Salem as before. Also, if Dallas, Independence, and Portland should all plug into their respective through switching jacks simultaneously, the same effect would take place, the currents from the different sources merely aiding each other after the connection is established at Salem. The operation of the apparatus set at Salem is on the plan of mechanically locking relay, which locks the lines together when actuated by

relays *C* or *D*, Fig. 3. This relay is operated by six dry cells, and for economy in battery consumption is made to disconnect the local battery after locking mechanically. By this means one set of dry cells can be made to supply the necessary current for a number of months, whereas maintaining the locking action by means of current would shorten the life of cells to a few weeks or possibly days, depending upon the amount of traffic. Either relay *C* or *D* operating to the minus side actuates relay *A*, which when closed actuates relay *B*. Relay *A* is now disconnected from the battery on the back contact of relay *B* and, after a slight pause due to its sluggish properties, falls back. It will be seen from the diagram that this mechanically locks relay *B* in the operated position, disconnecting it electrically, and it remains in this position as long as relays *C* and *D* are energized, holding the lines connected for talking and ringing purposes. When the plug is removed from the through switching jack at the calling office, the current ceases to energize relays *C* and *D*, and upon one or both of these relays making contact on the plus side, which is in the normal position of the armatures, current again flows through a make contact of relay *B*, actuating relay *A* and unlocking *B*. Upon relay *B* returning to its normal position the current in relay *A* is broken, and it too returns to its normal position, when the set is ready for another switch.

Grounded ringing on one line in the normal position of relays *A*, *B*, *C*, and *D* will not affect the other line since relay *A* must pick up, and after that relay *B*, and the time necessary to accomplish this is found to exceed the duration of an impulse where the ringing frequency is over fifteen cycles per second.

The mechanism used for locking up relay *B* in this circuit is capable of wide application. By using a heavy momentary current, it is possible to give the relays a heavy contact tension, thereby reducing the liability to get out of order. The fact that the current is but momentary allows dry cells to be used in stations where storage battery is not available to operate the relays. This form of locking relay can be used at stations on toll lines where it is desired to have a means of cutting a line in or looping it through a station for testing or switching purposes, and yet due to length of cable or other conditions it is impracticable to allow any permanent legs or loops from the lines, the relays being controlled from contacts on the switching jacks in the station equipment.

Many adaptations other than recounted here may be made—such as through switching between any two of three lines, where all terminate at one office; switching from either of two lines to either of two lines, where all four terminate at once office; or switching of three lines in tandem through two through offices, etc. In other words the apparatus sets described may be modified to satisfy an almost endless number of traffic, operating, or electrical conditions. If it is desired to have lamp signals show over the line jacks at the through office to apprise the through operator that the lines involved are busy by reason of a through call handled remotely, a very simple modification in the apparatus set at the through office will accomplish it. Further, a lamp signal might be provided at the terminal offices to apprise the operators as to the busy or idle condition of the remote lines, obviating listening in to determine it.

(To be continued).

A. Eugene Michel and staff, advertising engineers, New York, have removed from 21 Park Row, into larger office, rooms 1001-7 Woolworth building.

Nebraska Commission News

In addition to a $6 rate for business telephones, with suburban service, a rate of $4 for additional business telephones has been made in Lincoln by the Lincoln Telephone Company with the approval of the Nebraska Commission. This rate is intended for business firms who desire more than one telephone and is for telephones to be used only for incoming calls.

Six officers of the Hooper Telephone Company called on the railway commission to present a grievance against the Bell Telephone Company at Fremont. The latter concern a year ago absorbed the independent exchange at Fremont and has since transferred all but fourteen telephones on that exchange to its own switchboard. As a result subscribers at Hooper, who formerly enjoyed free service with Fremont, cannot communicate with anyone there except the fourteen who still have telephones on the old independent exchange. The commission is asked to make an order directing that trunk lines be put in by the Bell connecting its main exchange at Fremont with the remnant of the one that has been dismantled. A bill requiring such connection in cases of this kind was passed by the recent legislature, effective July 17.

The first order issued by the state railway commission requiring compulsory connection of telephones was announced in the case from Liberty, where patrons of the Liberty Independent Telephone Company petitioned for long distance connections over the lines of the Lincoln Telephone and Telegraph Company. The latter company was not a party to the complaint, but was reported to be willing to sign a contract for long distance service on the basis of 15 per cent for incoming and 10 per cent for outgoing call, as a commission to the Liberty exchange.

The commission says that even without an order on its part the Liberty company would, after July 17, be compelled to furnish the connection asked under House Roll No. 21, passed by the legislature, a companion bill to the Fuller county telephone act.

More Stockholders for A. T. & T.

Recent declines in American Telephone have produced investment buying, with the result that the company now has the largest stockholders' list in its history. The total is not far from 54,000 names, which compares with 50,000 on the first of the year and 47,000 at the beginning of 1912.

It is interesting to know that 60,000 shares of American Telephone are held in France, which is somewhat larger than the English holdings. This stock is counted for but one name although probably held by 10,000 to 15,000 small French investors. Taking England and France together it is safe to place their total investment in American Telephone shares at about $10,000,000?

The $65,000,000 convertibles offered shareholders early this year were taken by 10,713 stockholders and others who purchased rights. This means that 40,000 at least of the stockholders sold their rights and probably 45,000 must have sold, as it is safe to assume that half of the 10,713 owners of the bonds represent those who bought into the company for the first time.

The bonds are, of course, relatively less widely distributed than the stock, and the success of the issue—the underwriters getting only $1,556,300 of the entire issue—is significant when the comparatively limited participation of stockholders in number is considered.

Contracts, Enforceable and Unenforceable

By Walter K. Towers

WHEN, in the ordinary dealings of life, you arrive at a business agreement, you expect to carry out your part, and expect that the other party will carry out his. Almost invariably, in the ordinary agreements that are regularly arrived at, each of you promises to give something or to forego in return for what the other is to do under the agreement. He is to mow your lawn; you are to give him fifty cents. He is to rent your house, paying you twenty dollars a month; you are to furnish him with the use of that house. There is mutuality of obligation, and thus the difficult question of the consideration so necessary to contracts does not arise.

You have agreed definitely enough with your neighbor that he is to have the trees now growing in your acre woodlot, and he is to pay you a hundred dollars therefor, the trees to become his property as they stand. Each of you is to give something, so there is consideration. You do not want litigation to arise from this agreement; you do not want, or expect, to go to court to have it enforced, else you would not have entered into it—for the unprofitability of "buying a lawsuit" is proverbial. But you do want to have the agreement in such form that, if disagreement should arise you would be able to enforce your rights. You may not be able to "lick" Neighbor Jones; and, even if you can, that would only involve you in an action for assault and battery. You want the contract in such form that if you must assert your rights you will have them in a form which the law —the procedure provided for the enforcement of rights— will recognize.

Probably the principal reason why the average man finds his contracts unenforceable is because of the lack of the written evidence which the law requires in certain classes of cases. In the case of the sale of the standing timber the law of most states requires that it be evidenced by a writing signed by the party against whom it is to be enforced, otherwise the courts would not enforce it. A statement of the principles which determine in what form a contract must be evidenced to be valid may not possess the interest attaching to other branches of the law, but they are of the utmost practical importance to the average individual in the guidance of the business affairs of everyday life.

There are probably no two sections of written law which possess the practical importance, or have had the far-reaching influence of the 4th and the 17th sections of the Statute of Frauds, enacted by the English Parliament in 1676. These provisions have been re-enacted by the legislatures of the various states in but slightly varying form, and the principles are firmly embodied in our law and are set down to guide all of us in the formation of our contractual agreements. Every student of the law memorizes these provisions.

What is known as the 4th section specifies certain classes of contracts which must be evidenced by a signed writing if they are to be enforceable. The first of these is an agreement by an executor or administrator to answer damages out of his own estate. Of course, one holding such a position is not personally bound to pay the debts of the deceased out of his own pocket; but if he does so agree, it must be in writing, if he is to be bound by his promise.

The next class of agreements covered are those "to answer for the debt, default or miscarriage of another." If some third party suffers under an existing, or contemplates a future, liability and you agree with his creditor to make it good for him, that agreement must be evidenced by a writing signed by you if you are to be bound by it. Suppose John Sims comes to you, tells you he has no money, and must have a pair of shoes, and you agree to see that he gets them at the store. You go with him to the storekeeper and say, "Let Sims have a pair of shoes, I will see you paid." By this statement you have become directly and personally liable and it is not within the statute. But if you say, "Let Sims have a pair of shoes, if he doesn't pay you I will;" then this is a contract to answer for the debt of another within the statute and there must be some written memorandum signed by you if the agreement is to be enforceable.

One of the most important of the provisions is that any contract or sale of lands, or any interest in or concerning land, must be evidenced by a signed writing. This is the provision that requires that a contract with reference to standing timber be in writing, for it is with reference to realty. So, too, contracts to buy land, or for mineral rights are within this provision and must be in writing. It is to be noticed that if the contract calls for the delivery of timber or of coal from the lands of the owner by the owner, that is not within this provision, since he himself is to cut or mine it, thus severing it from the land so that it loses its character as realty. But if he sells coal or oil as it lies beneath his farm the contract must be in writing. The same applies to all leases, except short term leases, which are excepted in most of the states.

Or if a contract is not to be performed within a year from the making thereof it must be evidenced by writing to be enforceable. This applies only to contracts which *cannot* be performed within a year. Thus leases for a period of over a year from the date when they are made, contracts to work for over a year, etc., must be in writing. But if you agree to support Sam Allison for the rest of his life, that contract is not within the statute for, though Sam is but twenty years old and in good health, he may die within a year and thus the contract be performed. True, if you hired Sam Allison to work for you for a year and a half he might die and that would end the matter, but it would not be a performance of the contract as would the other.

The seventeenth section provides that contracts for the sales of goods, wares and merchandise for the price of $50, or over, shall not be good unless there is written evidence signed by the party to be charged, or part delivery and acceptance, or part payment. The amount below which the statute does not apply is varied by the statutes in the various American states which have reenacted this provision in varying forms.

It is to be noticed that the contract is the agreement, not the writing. The writing is merely evidence of the contract. It may be made at any time after the contract has been agreed upon, up to the time of suit. The writ-

ing need not be a formal document to comply with this statute. Any note or memorandum is sufficient so long as it contains all the material terms as the names of the parties, the subject matter, the consideration given, etc. There may be several papers, as a series of letters or telegrams, so long as they are consistent and connected. The necessary signature of the party to be charged may appear at any point, and may be affixed either by the party himself or his authorized agent. Thus at an auction the auctioneer is the agent of both parties and if his memo contains the essential terms his entry of the names of the parties will amount to the necessary signature and complete the required writing.

The law of some states requires that some contracts be under seal as well as in writing. In many states seals have been abolished. In all states the tendency is to lessen their effect. The principal reason that makes the seal of comparatively little import is that it is required only on the most important and formal of contracts, as deeds. The printed forms provided for these instruments include a seal; and further, these are instruments of an importance that requires the services of a competent attorney who is familiar with the requirements of the particular state and will see to it that the necessary formalities are complied with. The simple legal scroll (L.S.) has now been generally substituted for the more formal wax seal. Seals, used where not necessary, are merely superfluous.

It should be remembered that all contracts need not be in writing. The general rule is that if no statute requires that the particular kind of contract be in writing it need not be, and so contracts other than those specified in the statutes may be oral. Of course, even though no writing be required, prudent men frequently draw their contracts in writing that the evidence may be preserved in more permanent and indisputable form should trouble arise. If the matter is of considerable importance, better embody the terms in a letter addressed to the other party, sign it, keep a copy, and see that he replies over his signature accepting the proposal and terms.

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The Telephone Service Association's Work

The Telephone Service Association is now occupying its own offices at room 1014, 39 South La Salle street, Chicago, as previously announced, and while it has no connection with any other associations, being maintained strictly as an organization of the operating companies, it will co-operate with every independent telephone association at all times.

The association has been sharing the offices of the National Independent Telephone Association for the past few weeks; arrangements for working in harmony with the national body and occupying the same office being made at a meeting held in Chicago a couple of months ago by the executive committees of the two associations. As the work of the service association progressed, it was found that a general feeling prevailed that this organization should be operated individually with its own offices, and such action has been taken.

As is generally known, the association proposes to assist the operating companies in every way possible, and is prepared to take care of the inquiries of its members at all times. The various committees of the association are composed of the best engineers in the field. Splendid results have been secured through the association by many companies, and as future plans are completed, many features highly beneficial to the members will be available.

One of the most important matters now being handled is the distribution of the new operating rules. Requests are being received for the new books from companies in all parts of the United States and Canada, and it is felt that these books are the best that have ever been compiled for the independent companies. Therefore, it is sincerely hoped that all of them will assist the association in securing the adoption of these books by every company in the field. As stated heretofore, the book is gotten up in loose leaf form with art canvas cover and contains 72 pages of up-to-date information for the proper handling of long-distance traffic, with several blank pages for any special rules that may be effective in the local offices. These rules will be furnished to members of the association at 25 cents per copy, and 50 cents per copy to non-members.

At the executive committee meeting of the association held in Chicago on May 28, several matters of importance were acted upon—one being the arrangements for incorporating the association, and another, plans for its financial support. Naturally some of the larger companies are carrying more than their share of the load, but in order to make the organization what it should be, this, with the financial assistance of all the smaller companies, is necessary. It was also felt that the association was of great interest to all the manufacturers, and so it was decided to solicit every manufacturer for a contribution towards the support of the organization. As continued independent telephony and better service means more business for them, it is hoped that every manufacturer supplying the independent telephone companies will do its share in supporting this work. No recommendations regarding equipment or supplies will be made, all manufacturers being treated with the same courtesy. It is also hoped that they will all help to promote the interests of the organization through their sales departments; that is, have their salesmen put in a good word for it with every operating company, and in this way the association will become known to all throughout the country.

Checks should be made payable to the Telephone Service Association, and forwarded to the treasurer, L. J. Wylie, Decatur Home Telephone Company, Decatur, Ill., or sent to the association's office at Chicago. The dues of the association have been placed on the following basis: A minimum fee of $5.00 per annum for companies with five hundred units or less (a unit being one telephone or one circuit mile of toll line); for companies with over five hundred units, the fee to be one cent per unit per annum.

The Service Association is co-operating with state associations of independent telephone men in the following manner: When the members of such associations join the Service Association in a body, the minimum limit of $5.00 is waived, and each member pays only on a unit basis. Thus a company operating only 300 telephones or toll circuit miles would pay only $3.00 a year, when joining through its state association.

There is some mighty good work going to be done through the association, and engineering bulletins will be sent out just as soon as the preliminary work in getting settled in the new offices is completed. The manager, Frank L. Eldridge, will spend a good share of his time calling on the various companies in order to ascertain what the association can do to assist them, and many other things will be done for the benefit of the industry.

Telephones in Central Station Control

By Angus S. Hibbard*

WHERE one brain and one pair of hands best fitted to any task may be put in control of all its elements, we may look for the most highly finished product. In science, in the arts, in literature or invention, the best things have nearly always been those accomplished by some one individual. Such personal accomplishments may represent an ideal in quality, but this ideal cannot well apply in quantitative undertakings involving a large number of people or elements and the man who thinks he knows it all and tries to do it all is rarely successful or popular in matters o fany considerable size. Organized effort, however, shows its appreciation of the personal ideal by endeavoring to set up conditions whereby some one master mind at the top may give out the plan and policy to be pursued, and, through established channels, direct the efforts of all concerned. The same thing is true down the line where heads of departments and sub-departments, all interrelated, direct personally those things for which they are accountable.

It has been said that a business is at its very best when its purposes are best accomplished and the management has the least to do. Some one put it more tersely, saying: "If the bosses can ever truly say that they have nothing to do, it will be time to raise their salaries." Such statements, however, must be accompanied by equally convincing statements of conditions as they actually exist, and to state fully the condition of any business, there must be available full knowledge of just what is going on. In many businesses information relating to existing conditions may be gathered more or less at leisure or as may best suit those who are in charge. A store may be closed to take inventory, or a factory shut down for some general overhauling. Both may control their methods and quantity of output, while the public, broadly speaking, is not affected. Not so are the public service businesses, the railways and carriers of all kinds, the water, gas, electric light and power companies, the telegraph or telephone companies, all of whom must render service, not when and as they choose, but when, and, to a controlling extent, as their customers, the public, may choose.

Railways must provide trains at such times as people wish to travel—they cannot make them travel at times most efficient from the point of view of railway operations. Electric light, power and gas companies, telephone and telegraph companies must provide facilities to fit a load line which is established by the public and is something over which the companies, themselves, have no control.

In the public service business we have, therefore, conditions constantly changing because of demands which are practically uncontrollable, requiring not only the best kind of organization and management to insure success, but the best and most comprehensive means of knowing just what is going on, not from day to day, but constantly from minute to minute, during what may be called a continuous performance, and there can be no closing down for inventory, or repairs, or anything else. The wheels must continue to go round, and the public, without previous notice, determines just how fast they shall go. Under these inevitable circumstances, it may be said that the best service is rendered by those who keep in the closest and most necessary touch with the fluctuating conditions of this public demand, and, in turn, have the best and most immediate control of the means of meeting it so that, as nearly as possible, some one officer in charge may observe and direct operations.

All utilities are expected to be so designed that they may provide for average maximum demands for service. Probably no utility could be either well or profitably managed if designed to provide for the extreme possibilities of service. No railway, for example, could suddenly carry all the inhabitants of a large city at one time, or even in one day. In no telephone exchange could all of the subscribers talk at one time. Indeed, it has been said that if all telephone subscribers should call at once, everybody would get nobody, and nobody would get anybody. The average maximum demand, therefore is studied and provided for; but even in this, not all utilities are affected alike in case of overload. In railway or street-car service, sudden emergencies are met by carrying as many passengers as possible, but the demands of those who are not carried may not seriously interfere with the successful transportation of those who are provided for. Sudden demands for gas are supplied from the storage reservoirs of gas companies, and, if not too long continued, may not interfere with the general service. Sudden demands for telephone service, although complicated by the fact that two patrons instead of one enter into the problem of handling each telephone call, may be taken care of to the full limits of the system.

In electric light and power service the problem seems to be quite different, because in case of excessive overload the entire service is affected. In large communities it is the practice to provide a considerable margin of supply over and above the average maximum demand which may be reasonably anticipated, but in such a case if this maximum demand suddenly doubled, the system would break down and no service could be rendered to any patron. Moreover, electric light service seems to be subject to, perhaps, more sudden demands than other services. The load line running between minimum and maximum averages is, under normal conditions, fairly regular, but changing conditions bring about sudden and violent variations. A sudden storm, bringing about a temporary condition of partial darkness, may in ten minutes increase the lighting load 100 per cent, requiring the services of additional boilers, engines, dynamos, storage batteries, and all the sources of output, as well as a rearrangement of the facilities of distribution.

It is not surprising to find, therefore, that electric light and power companies, realizing these conditions, stand in the lead in providing unusual facilities for intercommunication and centralization of control, and, by extensive and well-engineered systems of telephones and supplementary appliances, have installed most efficient and up-to-date means of knowing just what is going on and for directing their service.

The time seems to have gone by where, even in small light and power installations, the management is satisfied

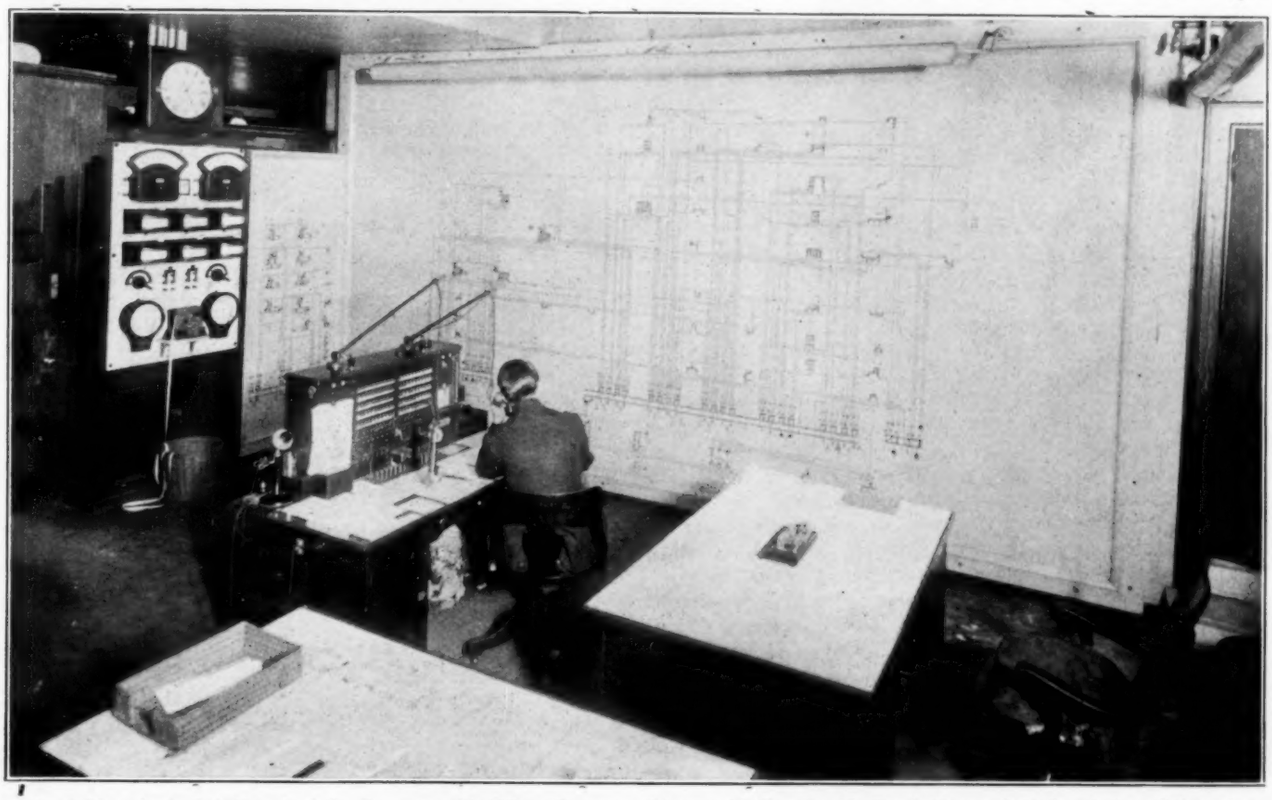
*Paper read before the National Electric Light Association.

to start up the machines and let them run along without regard to rate of use or volume of output. With the growth of these plants and the consequent needs of greater efficiencies and economics, it has been necessary to secure more immediate and extended knowledge of operating conditions and a more centralized control, and these results have been obtained in the greatest degree where the best means of communication between all elements of the business have been supplied. An outline of what has been done by the lighting and power companies in a few of the larger cities will illustrate present conditions, showing the endeavor to centralize the control of their great systems so that one brain and as nearly as possible one pair of hands, may best direct operations. As the relative capacities of the various plants are well known, they need not be referred to in detail.

building conduits to provide against local interruptions, and all of the substations are equipped not only wth direct trunk lines from this operating center, but from the city exchanges, and the wires are led in through separate cables, and. where possible, from different streets, to avoid interruption from fire or other causes.

From this operating switchboard pneumatic tubes extend to the telephone switchboards at each of the Waterside stations, and through these tubes all routine instructions of the system operator at the switchboard are sent in writing, confirming telephone instructions.

Directly in front of this board and in full view of the system operator is being installed the so-called "pilot board," designed to show automatically the operating conditions of the entire plant. At each end of this board, boiler and current recorders show the existing output



Load Dispatcher's Switchboard of the Commonwealth Edison Company, Chicago, with Two Outside Trunk Lines and 80 Terminals and Extensions, on Which the Company Pays a Mileage Rental on Over 200 Miles. This Board Is Used for Interior Operating Purposes Only, and Gives the Load Dispatcher's Office Direct Communication with the Principal Nerve Centers of the System.

In the city of New York, the two Waterside plants of the New York Edison Company constitute the producing center, at which an officer called the "system operator" directs the operations of the entire system. It is his duty to keep in service at all times sufficient generating, transmission and transforming apparatus and to take care of any demand on the system, and no apparatus is put in or taken out of service except by his direction. He is provided with a telephone switchboard, from which lines run to 42 substations, also, trunk lines to the city exchange. The switchboard is ordinarily used by two operators (the equipment being in duplicate throughout), but is so arranged that during emergencies six operators are afforded facilities without interference. To this switchboard there are duplicate battery and signaling leads from two separate telephone exchanges. The building wiring is divided and led through separate

of boilers and generators for the two stations. On the face of the board the districts of each of the substations are subdivided into small panels, indicating the oil-switches by numbers given to the feeder leads. The conditions throughout this distributing system are shown by small electric lamps. A red lamp lighted shows that a switch is closed, a green lamp lighted shows that a switch is open, and these lamps are controlled automatically by the switches themselves. At each end of this pilot board the instruments which indicate at all times the total load carried by each station show how the load is divided as between 25-cycle and 60-cycle systems, the voltage and frequency of each system, and the current, if any, which is flowing from one station to another. In any emergency, therefore, by a glance at these instruments and the pilot board, the system operator is as conversant with the conditions at each station as though he

were standing before all of the switchboards at the same time. Consequently he is instantly in a position to direct by telephone the resumption of normal conditions without the delay heretofore necessary awaiting reports from switchboard operators as to their conditions, these conditions now being displayed automatically before him.

Previous to the use of the pilot board, the system operator received all reports of outside conditions by telephone, and indicated operating conditions throughout the city by the use of colored tags, suitably numbered, and placed upon a large operating board representing the distributing system.

To still further safeguard the service during emergencies, the New York Company has installed a signaling system consisting of standard fire-alarm apparatus comprising circuits reaching substations, so arranged that the system operator may send signals over all or any combination of the circuits at one time, such signals being recorded on paper tape and time stamped. For each signal there is provided a small brass wheel with notches corresponding to the signal number cut into its periphery. The signal numbers represent a predetermined code of instructions for this emergency service. For example, "2 2, trouble at Waterside; 2 4, system grounded, look over your apparatus and promptly report conditions to system operator; 4 7, conditions normal; 6 6 (time signal). Correct time is 12 o'clock noon." This latter is used as a daily signal to test out the system, which, as indicated, is designed to care for unusual emergencies.

Adjacent to this signaling system is the city fire-alarm signaling apparatus, by means of which all alarms turned in on Manhattan Island are received by the system operator. This apparatus was installed in connection with the city high-pressure pumping stations, current for which is supplied direct from the Waterside plants. As these high-pressure stations use current only when there is a fire, the system opperator, by receiving all fire alarms, knows just when the pumping motors may be expected to start, and is kept in touch with the situation during the progress of any fire.

Located at the side of the switchboard are boiler signaling switches, by means of which the system operator signals to the boiler rooms the number of boilers required to carry the load. All routine communications between switchboards and the turbine rooms are carried on by means of lamp signals, and attention is called to them by means of electrically operated steam whistles. As weather conditions affect to a very large extent the demand on the stations, an outlook is stationed on the roof of the Waterside building every day in the year except Sundays, with a direct telephone line to the system operator, to report any unfavorable weather conditions.

During the winter months, the load of the Waterside stations increases from 4 to 5 o'clock in the afternoon about 90,000 kw., or at the rate of 1500 kw. per minute, and during thunderstorms in summer it may increase 50,000 or 60,000 kw. in from five to ten minutes, or at the rate of 5,000 to 12,000 kw. per minute. To take care of these peak loads, reserve boilers are carried under steam during the entire year.

When there are indications of a storm, the boiler rooms are signaled for the reserve boilers and additional turbines are started, connected to the bus-bars. During the approach of the storm, steam is shut off from these turbines and they are run as motors, in this way being available to take their share of the demand in about ten seconds. With the coming of partial darkness, the load advances so rapidly that it is practically impossible to so control the substations as to keep the load divided between the Waterside stations as apportioned, and during such periods the flexibility of the system, due to the parallel operation of the two stations, is apparent, excessive loads of one station being relieved by the other. At times, from 10,000 to 20,000 kw. may be going from one station to another in one minute, and a few minutes later this condition may be entirely reversed. Successful operations under these extreme conditions is evidently made possible by the centralization of control which has been described, and this in turn is made possible by the systems of intercommunication which bring to the one official in charge knowledge of what is going on and furnish the means of carrying out all possible directions.

In the switch-rooms of each of the Waterside plants there are installed telephone switchboards, with lines extendin to the board of the system operator, the turbine-room, the exciter switchboard and the company's operating department branch exchange. There is also an intercommunicating telephone system with from 20 to 30 stations, located in various parts of the switchboard galleries. In each of the Waterside stations, telautographs are also used between the high-tension switchboard and the exciter switchboard, so that instructions may be recorded. Here, again, we find that one directing head in each power station may control by telephone all parts of his plant as directed by the system operator, the endeavor being to provide a completely centralized system of information and control. In the substations telephone switchboards are located, connected by trunk lines with the switchboards of the system operator, the plant and service departments, the general offices and the telephone exchange.

For the plant and service operations of the company, a four-position switchboard is installed in the supply department, Forty-first street, with 26 trunk lines connecting with telephone exchange, and 116 extensions and trunk lines reaching the general offices, the district headquarters, branch stations, contract offices, etc., there being 11 trunk lines to the general offices, 5 to the second district, 2 to the third, etc. None of these trunk lines or extensions are listed in the telephone directories, and it is not expected that the public, through the general telephone system, will at any time be brought into communication with the company through this system, which is provided for the exclusive use of the company's employees, upon its business between various offices and branches throughout the city, and for these purposes is carrying a traffic of about 5,000 calls per day at the present time.

A special telephone directory is printed by the company giving locations and telephone numbers of offices and stations, and names and numbers of officials and departments, both for regular service, and for night, Sunday and holiday calls, the residence telephones being used to call out the forces at such times.

In Chicago, the Commonwealth Edison Company, in addition to a 12-position switchboard operated as a main exchange and connected with all operating plants and branches of the company, has what is termed a load dispatcher's board, with outside trunk lines and 80 terminals or extensions used for operating purposes, which gives the load dispatcher's office direct communication with all the power plants and distributing centers. Each of the large generating stations is provided with a switchboard with outside trunks and connecting trunks to the company's main switchboard, and terminal stations

throughout the plant. In addition, each of the generating stations is provided with an intercommunicating telephone system reaching ten different points. The load dispatcher's switchboard of four positions is independent of the company's main switchboard, and as nearly as possible, wires to these boards and all others in substations or generating plants are conducted over separate routes to avoid interruption of service. These telephone facilities are supplemented by appliances indicating automatically at each station the output of the other stations, making possible, to a certain extent, the operation of different stations according to predetermined schedules.

In Boston the lighting and power system is controlled and centralized by means of a principal supervisory telephone exchange, with five tie lines to the company's main exchange, two trunk lines to the South exchange and 42 circuits to outside power plants. The company's principal exchange is a six-position switchboard, with 36 trunk lines and 193 stations, and in addition a special supervisory switchboard in the commercial department—an elaborate system for reaching customers and the general public.

In Philadelphia, Pittsburgh, Cincinnati, St. Louis and other cities, the lighting and power companies are utilizing telephone service in a like manner for centralizing information and controlling operations.

These telephone installations and the elaborate supplementary systems installed in a few of the larger cities certainly indicate the value of such service, and show particularly the advantage of separating from the service essential to the company's own operations, within itself, the public telephone service connected with customers and the general telephone exchange. The introduction of such special and separated service and its successful use over a considerable period seem to show that it is well worth while.

From the very nature of electrc light service, it is essential that there should be means for the quickest kind of communication between the company and its customers, and the telephone is naturally used for that purpose. Here, again, it is interesting to find that the companies in many cities have specialized on the telephone and developed methods which not only increase the efficiency of their own service, but which, to some extent, have been followed by other corporations, and might well be followed by all telephone users.

We find, in Chicago, in the offices of the Commonwealth Edison Company, a main private branch exchange of 12 operating positions, with 100 trunk lines and connecting trunks, and 475 terminals and extension telephones. Traffic reports show that about 17,000 messages are handled daily, or upwards of 5,000,000 calls each year. In connection with this main switchboard, there are two subsidiary boards in the testing and contract departments, and also about 30 so-called key cabinets, or intercommunicating switches of from 2 to 10-line capacity, each used in lieu of a subsidiary switchboard, the principal installations being in repair and renewal departments where a great many customers' calls are received by clerks trained for this purpose.

In the plans being made for the removal to another building of the general offices of the Commonwealth Company in 1914, a 30-position telephone switchboard is being provided for. In the commercial work of the company telephones are provided for solicitors the lines of which are connected to a monitor switchboard, so that, in the absence of a particular solicitor, the monitor board operator may answer calls, insuring prompt attention to the customer. Applications for electric service are accepted by telephone as a part of the regular commercial work. During 1912, 13,609 such applications were recorded, together with about 5,500 orders regarding meter service. During the last five months of 1912, there were 8,149 telephone inquiries regarding service and 12,672 requests for solicitors to call.

The above figures indicate the growing relations between the public and the company with regard to contracts for new service, as well as carrying on existing relations by means of the telephone.

The Commonwealth Company was, perhaps, one of the first to extend its telephone facilities largely into this public relation. The second edition of its book of instructions, entitled "About Telephones," is dated November, 1911, and states that "The telephone, which was a relatively unimportant adjunct to our business 16 years ago, is now the principal medium of communication with our customers. . . . For this reason, it is a matter of the most vital importance that our telephone service, which we aim to make the best in the city, should be characterized by unfailing promptness, courtesy and accuracy." There follow brief instructions relating to promptness in answering calls, how to answer them, and inviting an avoidance of the word "hello." These, and various other points are further elaborated in the "Employees' Hand Book" of the Commonwealth Company, and the company's idea of the A B C of telephoning has been particularly indicated by an attachment to each telephone transmitter, to which, I feel sure, no telephone company will object, and upon which is printed, in large letters, the words, "ACCURACY, BREVITY, COURTESY."

The New York Edison Company has also provided comprehensively for communication from and to the public, having installed in its general offices a private branch exchange with 51 trunk lines and 267 telephone instruments. There are, in addition, 19 private branch exchanges in various offices of the company throughout the city, having 79 trunk lines and 378 telephones. The full telephone equipment of the New York Company at the present time is 24 branch exchanges, 750 telephone extensions, 161 trunk lines, 66 tie lines, connecting various switchboards of the company, 446 miles of telephoning circuits, 25 direct exchange lines, and a traffic running about 20,000 calls per day.

The 1911 edition of the company's pamphlet concerning telephone service states: "A large part of our business is now transacted over the telephone. The public deals with us by telephone—we deal with ourselves by telephone. The telephone is the chief means of communication between our many departments and employees scattered over the city. Our commodity, electric current, is distributed by a system that resembles train dispatching, done over a special telephone system. Now, as the telephone is so very important to us, and becoming more so each year, we want to develop it as actively and intelligently as any other department of the Edison service."

Several pages of interesting and valuable sugestions in regard to the use of telephones follow this introduction. One interesting rule is to the effect that no patron who is answered by a representative of the company shall be "switched," even if he has been connected with the wrong department, the rule being that the call will be attended to as far as possible and completely taken care of by the person who answers, without switching from one department to another.

It would probably be just as difficult to find an elec-

tric light or power company without a telephone as to find a telephone exchange without electric light where it is possible to get it. This reciprocity may also be stated in terms of bills paid for service, and in this, the two cities of New York and Chicago will be found to be fairly representative of the entire country. For the year 1912, the amount paid to the New York Edison Company and the Commonwealth Edison Company for service was $162,821. The amount paid by these companies for telephone service was $107,320.

The classes of customers of the two interests are very much alike, and the distributing plants for both services cover very nearly the same areas. It is natural, therefore, that the relations between the two interests should each year become reciprocal to an increasing extent. Joint pole lines for the distribution of wires have come into more general use. Construction details for necessary crossings and for paralleling routes are now generally matters of agreement between engineers. Telephone companies are relying on your services increasingly each year for power and light, finding with the growing stability of the plants less of a requirement for duplication in the way of local installations.

For both services, lighting and telephone, so closely related and interdependent, I think it may be said that the officers in charge are endeavoring in the conduct of the business to serve the public efficiently in the spirit that they and all employees are directly accountable to the communities in which they operate for good and dependable results. The appreciation of these conditions by the public is indicated in the continued growth of the business. Both interests have been constant in the endeavor to increase the efficiencies of plant and organization, and have made this possible by highly developed systems of communication, as a constant means of knowing what is going on and for the control of the services rendered.

Some one at some point put forth the undisputed maxim, "Knowledge is power." In connection with the value to your business of this knowledge of what is going on, which I have endeavored to demonstrate, it seems fair to stretch the old maxim a little, and to say, in this case, that knowledge is not only "power" but "light" also.

Cat Interferes With Switchboard Service

The night wire chief of Main exchange, Washington, received a call one night from a large apartment house reporting that there was serious trouble with a private branch exchange switchboard, and asking him to come and look into it at once, says the *Transmitter*.

When he arrived at the apartment house the switchboard was deserted. An air of excitement filled the corridor of the place. The elevator boy said the board was "ha'nted," and the operator refused to take her position until something was done. All outward appearances indicated that the switchboard was in perfect working order.

"What do you think is wrong?" asked the trouble man.

"I don't know," answered the operator in charge. "But when I picked up a cord to answer a call a few minutes ago the cord was snatched from my hand and the most awful noise came from the inside of the board. And the rest of the cords just bounced up and down—and I left."

The trouble man investigated. When he had taken off the back of the switchboard he found a cat perched on the cord rack and frightened half to death. It was evident from the confusion of cords and weights that she had been on the cord rack when the operator rang. When the generator current coursed through Miss Pussy's feet the result can be imagined.

This solved part of the mystery, but the trouble was not yet O.K.'d. Pussy refused to budge, and the trouble man had his hands badly scratched when he attempted to pull her from the perch. Coaxing and cajoling were of no avail, and it seemed as though an all-night siege might result, when some genius suggested a saucer of milk and quiet. In about 15 minutes all was serene.

The unsolved part of the mystery is, how did the cat get in?

To Decide a Bet

The drop fell and the girl at the telephone exchange at *The Times* office answered the call.

"To decide a bet," said the voice at the other end of the line, "I want you to answer a question."

The girl at the telephone—or the one who used to be at the telephone exchange was used to that explanation. She answered thousands of questions "to decide a bet." The new girl said "All right."

"When a horse is hitched to a wagon," said the better, "does he push or pull it."

"Why, he pulls it of course," said the telephone girl.

"But he pushes against the collar, doesn't he?" contended the man who had made the bet. "I am betting that he pushes it. You see—"

"Why, I don't know anything about it," said the girl. "You'd better ask the editor, or a horse doctor, or—"

Just then another drop fell and a second voice said: "Say, just to decide a bet——"

But the girl on the switchboard broke the connection. Her predecessor got married to escape such things on the theory that most anything was better than answering questions to decide bets all day. Her successor may—well, there's no telling.

Wages Raised in Cleveland

Telephone girls employed by the Cleveland Telephone Company exchanges were surprised a few days ago when told that the company had raised their wage scale. Change was made also from payment on a monthly basis to a day schedule. The announcement was made by Norman Anderson, superintendent.

The increase will affect about 750 girls. In many cases it will mean another dollar or a dollar and a half in the weekly pay envelope. The aggregate increases will amount to about $40,000 a year. Minimum wage paid girls in the operation school were raised from $20 a month to $24 a month.

Penna. Lines Big Telephone Users

A striking illustration of the rapid growth of the telephone system, which many railroads use to some extent in dispatching trains, is afforded by the Pennsylvania railroad's experience. In 1897 it first used a few telephones for dispatching trains on the South Fork branch thirty-two miles long and not especially busy. The Pennsylvania system now uses 17,000 telephones and the tendency is constantly toward wider employment of this means of controlling the movement of trains.

European Telephone Development

By Fred W. Scholz

THE SIEMENS SEMI-AUTOMATIC TELEPHONE SYSTEM.

THE Siemens & Halske Company has a semi-automatic telephone system based on patents taken out by Merk in 1908. Figs. 1 and 2 show the diagram, illustrating the progress of a call. There are two subscribers, No. 1953 and No. 4237. When No. 1953 removes his receiver, a first selector *VW* cuts automatically into his line and opens a way to the group selector *I*. The relays *A* and *B* are excited, and the contacts *a* and *b* are closed. A trunk selector *DW* belonging to a certain operator *O* begins to rotate automatically due to the current over ground, battery, interrupter, magnet *M*, contact *p1*, contact *b*, ground. At every contact break, the trunk selector makes one step and pushes the contact arms c_1 and c_2 from one contact to the other. If the contact arm c_2 meets the grounded contact *a*, we obtain a circuit by way of ground, battery, testing relay *P*, contact arm c_2, *a*, ground. The relay *P* interrupts the circuit for the magnet *M*, and connects the instrument of the operator *O* to the subscribers line *v* by closing the contact p_2.

The operator therefore need make no move to receive the call. While she is repeating the desired number, the operator presses a key in a keyboard *N*. As soon as she has pressed down the proper keys, she is cut off by a contact *n* and is at the disposal of other subscribers since she can use a second set of keys seen in N_1. A contact *u* in the telephone line *v* is also opened, so that the operation of sending impulses from the keys *N* to the selectors should not be disturbed by the subscriber No. 1953. The impulses sent out by the keys set the contacts into the proper places to call No. 4237. As soon as the last impulse has been sent, the contact closes again, and the relays *A* and *B* fall off, whereby *P* is rendered currentless. This cuts out the keys from the circuit. Fig. 2 shows the diagram of a set of keys and dials. The set of keys consists of four rows of 10 keys each, which are designated *1*, *2*, *3* to *0*. The upper row has the thousand numbers, the second the hundred, the third the digits, the fourth the units. If any key is pressed down it remains

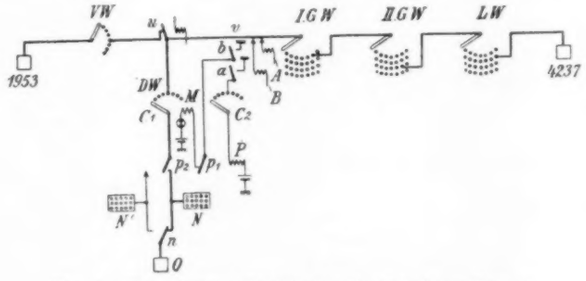


Fig. 1. The Siemens Semi-Automatic Telephone System.

in that position, while others previously pressed down return to the rest position.

The selectors consist of three discs, I, II, III. Three contact arms, one for each disc, are connected to a common shaft. The contact arm of disc I is connected to the selectors by means of the line *a*, while the contacts of disc I are grounded by way of a relay contact i^1. The action of disc II is as follows: The contact arm of disc III is connected with a relay *J*, and the contacts of this disc are connected with the working contacts of the keys. The keys of any row are in communication with the contacts of a quarter of the disc. Every contact of each quarter corresponds therefore to the number of its key. To make a connection, the operator presses down a key in each row. This grounds the corresponding contacts of disc III. When pressing down the last key, the driving shaft of the three contact arms is set in motion, and the three arms pass synchronously over the three discs. As long as the contact arm of disc I touches a disc contact, the selector line *a* is grounded. During the interval between contacts the line *a* is insulated from earth. The result is current impulses on line *a*. As soon as the contact arm of disc III touches the disc contact grounded by the thousand-key, the relay *J* is excited, current taking the following path: battery, relay *J*, contact arm, disc contact 3, key 3, of the thousand-row, ground. The relay *J* is held by way of the contact i^2, the contact arm of disc II, and the quarter of the disc marked 5'. In addition the relay *J* releases its contact i^1, whereby earth is cut off from the selector disc I, so that there shall be no current impulses when the contacts pass over the disc. When later the contact arms get into the space between the thousand- and the hundred-contacts, the relay *J* loses its current, because in this position the leading segment of the quarter 5' is without its contact arm. The relay *J* falls away, and again grounds the contacts of the current impulse disc I. The same process is repeated in each row of keys. This form allows a call to be made in 6 to 8 seconds.—*Elek. Zeit.*

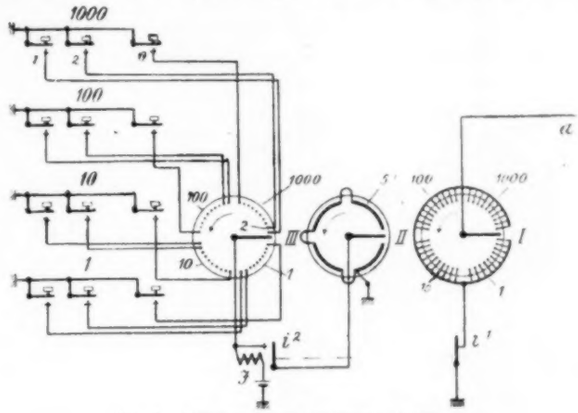


Fig. 2. Siemens Semi-Automatic Diagram.

PROTECTING THE TELEPHONE USER AGAINST CONTAGIOUS DISEASES.

Safeguards to protect telephone users from contagious diseases supposed to arise from the use of the same instruments by a number of people can be divided into two classes: 1. Guards against direct contact of the body with parts of instruments touched by other people. 2. Prevention of diseases through germs imparted to an instrument by a diseased person. Of course it is possible to combine both guards in an instrument. The methods used are: *a*. Preventing touching the instruments alto-

gether. *b*. Removing the germs from the dangerous surface before use. *c*. Preventing the spreading and transferring of germs. Attempts have been made to keep a certain distance at least between the instrument and the user. *1* in Fig. 3 shows such an attempt. We have here a number of wires leading out from the mouthpiece of the transmitter, which are tipped by balls. The balls and wires prevent the mouth from touching the instrument. No. 2 shows a paper mouthpiece or funnel which is set into a wire frame fitted to the transmitter. This paper funnel is supposed to be renewed for every user. It is clear that these two guards do not prevent germs from entering the mouthpiece, and they are just as liable to transmit disease germs as the transmitter itself.

The second solution (*b*) would be to remove all parts of the apparatus before use by a subsequent user, so that no germs can be transferred to him. The best method would seem to be frequent cleaning of the instruments, as by fastening a cloth saturated with some disinfecting liquid to the apparatus and encouraging the use of the cloth as much as possible. Another method would be lining the inside of the mouthpiece with felt or cloth saturated with a disinfector. In 3 such a felt stopper is attached to the transmitter and is to be inserted into the mouthpiece and the latter washed out before using the telephone. In 4 an automatic device is shown, which cleans out the telephone receiver. It is a threaded spindle with a wiper on the end. The spindle is worked by a spiral spring and will rotate the wiper mechanically as soon as the receiver is pressed down on the same. In order to facilitate cleaning, the surfaces have been made as even and as easily accessible as possible. No. 5 shows a transmitter finished in this way. No. 6 we have a cover fitted to the transmitter which must be pushed aside to allow communication, and thereby wipes off the mouthpiece. Mouthpiece and receiver are also made of materials that can stand hot water or weak acids, so that they can be cleaned every day. Instead of asking the user to clean the surfaces, a matter often not favored by the general public, the instruments can be covered with either a cheap protective cover, which can be renewed after use by each person, or else with removable covers of better material, that are carried by the users. For the latter arangements, exchangeable but also cheap pieces of paper provided with a rubber band might be used. Little blocks of paper of the right size could easily be carried by the user. If no rubber bands are carried, the shape in 7 could be used, where the corners of the paper are turned and the latter fitted loosely over the mouthpiece. A block of paper could also be attached to the instruments and each person would tear off a sheet and insert it funnel shaped into the funnel of the mouthpiece as seen in 8 and 9. To avoid the trouble of loose paper sticking in the transmitter, the guards can be provided with rigid rings that fit snugly over the mouthpiece, as seen in 10. A better scheme is shown in 11 where a roll of sanitary paper is fitted just above the transmitter mouthpiece. The paper is perforated and each person tears off a sheet and places it over the mouthpiece, the paper fitting and being held by two small guides on either side. An even better protection is shown in No. 12 where the receiver is entirely encased in paper. The same can also be done with the transmitter. The trouble with all of the above guards lies not in their clumsiness or their uselessness, but the inconsiderate bearing of the general public, which usually abuses such privileges and guards and wastes the paper so that no business or telephone company can afford to furnish the guards without charge. Judged from this standpoint it is better to have safeguards that belong to the telephone user and are attached by him. For this we want some durable and yet cheap protective device, that he can carry around with him and attach to any instrument without trouble. In 13 we have a round plate provided with a hole to permit easier communication, and clamped to the instruments by a metal clamp. As these guards might be infected from other instruments, they are connected to a disinfecting pocket which kills any germs that might stick to them, as seen in 14. In 15 we have a funnel that can be attached to any mouthpiece and is provided with a small spring which allows it to be fitted to any instrument. In 16 the funnel is made up of a number of rings which are collapsible and are carried flat in

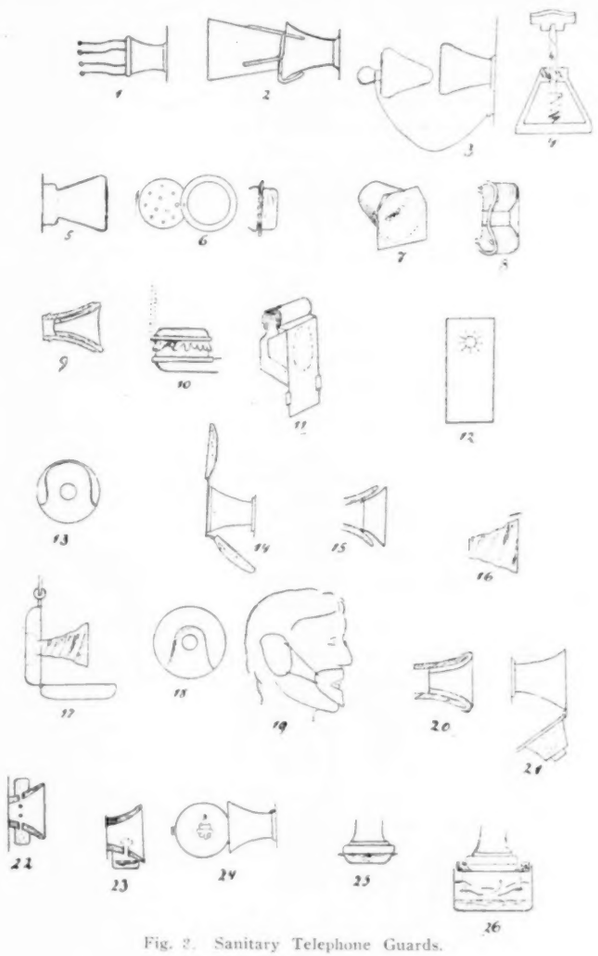


Fig. 2. Sanitary Telephone Guards.

the pocket and stretched to the proper dimensions when ready for use. 17 shows an exchangeable mouthpiece, which is carried by the user in a small case similar to a watch and is screwed to the telephone transmitter. The transmitter would be without the mouthpiece and no one would use the transmitter unless he had a mouthpiece of his own. 18 and 19 show an entirely different type of sanitary guards. Here the ear and mouth of the speaker are safeguarded by means of rubber or paper hoods and the instruments are without protection.

In order to prevent germs from spreading from an infected surface by means of the air (*c*), it is sufficient to keep the surface moistened and to collect the germs

by some disinfectant that shall retain them. If such an apparatus is used a great deal, however, large quantities of germs would collect in a short time on these hygroscopic and disinfecting liquids and the germs would be transmitted even when using the liquids. We would have to add sterilizing to our disinfectants and sterilize the dangerous pieces. We would have to make our diaphragms either of some metal like silver or else use some porous material that can stand a great quantity of the disinfectant. Another method would be to provide these parts of the telephone with a coating of some porous material soaked with a disinfectant. In 20 the mouthpiece is fitted with a lining consisting of some disinfectant. It was also tried to fill out the entire mouthpiece with absorbent cotton soaked in a disinfectant. The cotton would be so loosely packed that it would not interfere with the sound waves. In 21 the inside funnel is attached to the transmitter by a hinge. In 22 and 23 the mouthpiece has a small reservoir with a disinfecting liquid which either evaporates or develops fumes that kill germs. The trouble with this last scheme lies in the fact that most of the disinfectants are irritating and liable to affect the mucous membranes of people using the telephone frequently, or else give forth odors that no one can stand at such close range. In 24 the transmitter has a cover which is always closed unless the telephone is being used. Here the vapors would not enter the room except when the instrument is in use. A better system is that in which the user presses a rubber bulb and allows a certain quantity of vapor to enter the mouthpiece, and waits until the effect has somewhat worn off before using the telephone.

In 25 we have a disinfected receiver, the effect being obtained by laying the receiver in a treated base. The receiver is therefore disinfected all the time while not in use. In 26 the same system is illustrated only that here the weight of the receiver liberates some of the disinfecting vapors. When the receiver is lifted the vessel closes and the vapors are shut up and cannot trouble the user.

The requirements placed against an efficient sanitary guard might be summarized as follows: 1. All dangerous parts must be protected. 2. Every user must be protected. 3. Transmission of sound must not be hindered. 4. The sanitary guard must last for a certain time without requiring constant service. 5. The guard must be simple and cheap. 6. It should work automatically, as the public is usually too careless to work it properly. 7. The guard should not be obnoxious through an irritating odor. 8. It should require no changes in the shape of the present telephone instruments.—*Zeit. F. Schwachstrom.*

[EDITOR'S NOTE.—These devices are interesting but more or less futile, as it has been proven that no dangerous germs are carried by telephone mouth pieces.]

A NEW DISTRIBUTION SYSTEM FOR COMMON BATTERY SWITCHBOARDS.

A new system of telephone distribution at the exchange, which he claims will simplify matters considerably, has been worked out by J. Baumann, a German telephone engineer. The old principle of giving each subscriber an individual line and set of instruments with which he can call up the operator is reversed in that the exchange constantly looks for the subscribers that wish to make connections, using a system to be explained. All calls caught by the exchange are not sent to certain operators, but to any operator not busy, thus equalizing labor to the highest degree. About 50 to 200 subscribers have a common switchboard system which automatically distributes incoming calls to operators. Whereas in most systems a number of calls can come to any one operator, of which number she can only answer one, this new system receives only one call at a time and sends it at once to an open operator. At the same time every operator can be reached by any subscriber. The simultaneous burning of call lamps is also avoided and thus a current waste cut out, which amounts to quite little per year. In Fig. 4 we have the diagram of the new system.

To the contact *e* of switch *f* the b-line of a subscriber is connected. The line is connected, as the figure shows, with the inquiry keys, which are installed at every third operator's place, each subscriber having one key. If the rotating arm *g* of switch *f* rests on contact *e*, then the b-line of the coresponding subscriber is connected to battery and earth by way of electromagnet *h*. Arm *k* of switch *f* moves synchronously with arm *g*, but is insullated from it. The arm *k* makes contact with metal pieces *l, l,* as it rotates. Through this the metal rings *m, m* of a second switch are connected to the battery. The second switch *S* is provided with a rotating arm *n*, on which the brushes *o, o'* are attached, insulated from each other, however. The latter transfer the battery current to insulated contact pieces, from which lines run to the call lamps *q, q,* and to the speaking keys *r, r.* The inquiry keys are placed in series in such a way, that when one key is laid over i.e., when the operator is busy, no call lamp can light at her place, since the grounded connections of all other call lamps at this operator's place have been broken. To guard against misuse by the operator through laying over an inquiry key when no call is received, and thus prevent further calling, the following system is used: In a special registering circuit, depending on the speaking key, is a device which registers the time and period each speaking key is used. Another method is the use of a signal bell, which is automatically released and after a certain interval of time gives signals at the supervisor's desk.

A connection with this new system is made in the following way: The subscriber who is connected to contact *e* of switch *f*, lifts his receiver. When now the rotating arm *g*, which makes a revolution in two seconds, touches the contact piece *e'*, current passes from battery *i* over the electromagnet *h*, the arm *g*, the contact *e'*, the subscriber's line b-branch, the subscriber's telephone, the subscriber's line a-branch, to ground. The attracted armature of the electromagnet *h* stops the further rotation of the arm *g* which therefore stops at contact *e'*. The battery is moreover in connection by way of electromagnet *u*, arm *k*, which has been stopped at the same time as arm *g*, contact *l'*, with metal ring *m'* and by way of the brush *o'* with a contact piece. This metal piece corresponds to the call lamp *q* of the calling subsciber, which is grounded by way of the supervisor lamp *pl*. If the lamp is grounded by way of one of the three operators' places, then lamp *q'* and the supervisor lamp *pl* will light up. The electromagnet in this case will receive current and stop arm *n* with the brushes *o* in a position in which there is a connection between the contact piece and the metal ring *m'*. The operator now plugs the answering jack *d'*, the latter being built so that any operator can take the call from any subscriber, being therefore combinations of answering and multiple jacks and plugs. After plugging the proper jack, the proper answering

key, say r', is laid over. With this act the grounding of all call lamps connected to one operator's place is released. In other words no call can reach this operator as long as she is busy answering this call. The case might occur that during the time between seeing the call lamp signal and plugging the jack, a call is transmitted to the operator by some other switch f, while the two neighboring operators are busy at the same jack panel. In such a case the key for the preceding call is used and the circuit lamp-ground is broken. Consequently the electromagnet u of the second switch s is currentless, and the rotating arm of the latter continues its rotations until it finds an open operator. If all three operators are busy, the arm continues its rotation until it finds an open operator, in other words, until electromagnet u receives current over a grounded lamp, and thus stops the arm n in its movement. During the night, when service is lowest, the movement of the arms is stopped. Switches v, v, are used to disconnect the subscribers' lines from the contacts e, e, and to connect them to a common relay w, which operates a call signal.

In large exchanges where the number of connections is too great to unite them in one exchange, this system can be used to operate the trunk lines between the different exchanges. Every group of A-operators and the corresponding group of B-operators of the other exchange receive rotating switches, which work in pairs. During one rotation one switch of the pair of switches is at the disposal of each of the A-operators. If the switch at the A-operator's place is busy, the switch looks for an open B-operator and then an open trunk line and announces this fact to the A and also the B-operator, whereupon connections are made as described. The automatic selection of a free B-operator eliminates the disagreeable occurrence of more than one A-operator calling the same B-operator, and thus avoids mistakes and trouble.—*Elektrotech Zeitschrift.*

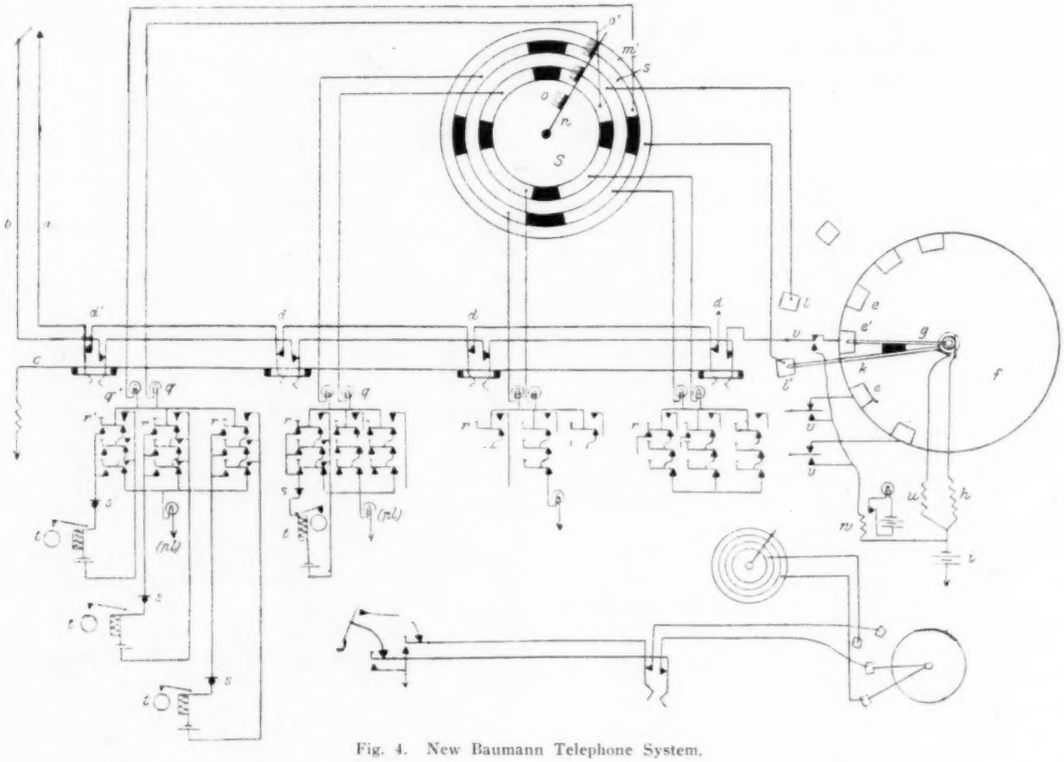


Fig. 4. New Baumann Telephone System.

THE OUTLOOK OF SUBMARINE CABLE TELEPHONY.

La Lumiere Electrique brings an interesting discussion on the present outlook of telephony using submarine cables for communication. Devaux-Charbonnel, who is the author of the article, holds that wireless telephony is in no state at present to take the place of cable telephony. The last three years of course have brought great results in submarine cable construction. The three submarine cables laid between England and France and England and Belgium have worked to complete satisfaction. The specific damping effect per km. is, however, rather large, although lower than that in older types of cable. In order to connect places far apart the damping effect should not be greater than 2.5 or, better, 2. Under these conditions it is hardly possible at present to speak over greater distances than 200 km. However, with a cable having a copper conductor of two ohm resistance and the usual guttapercha insulation it might be possible, using Pupin coils, to make cables with a damping effect of *beta*=0.006. Such cables would enable communication over distances of 560 km. When laying cables we must remember that they lie at great depths. The distance between France and Corsica is only 200 km, and yet the depths reached are in places 2500 meters. Although telephone lines use double lines, manufacturers have not succeeded as yet in making cables with double conductors that are entirely symmetrical. A cable with four conductors, *i.e.*, with two double lines could perhaps be constructed, but this is not advisable. It seems impossible to build a cable of that type at a weight less than 2 kg. per meter in water. With an average sea depth of 2,500 meters, the tension when laying the cable

would be almost 5 tons, which none of the present cable laying machines can stand. Consequently we have to use cables with one conductor only. The cost of one conductor is high, from $400 to $600 per kilometer. The question is, however, whether the results in telephoning will be satisfactory. It might be possible perhaps to get grounded circuits by using the bottom of the sea as earth and thus get a return circuit. More important is the fact that the characteristic which with guttapercha-cable copper conductors is low enough, is still lower with single conductors. The resistance of single lines is of course reduced by one-half when using d.c., but with a.c. the effective resistance increases with the number of periods. The capacity rises to double the quantity, the self inductance sinks to one-half and the damping effect is unfavorably influenced.

Tests made with overhead lines showed that with a.c. of 1,000 periods all wires show the same effective resistance of 4 ohms per km. The submarine cables with double conductors showed an ohmic resistance of 4, those with single conductors one of 2 ohms. The self inductance with the first was 7.26, with the latter 3.86; the capacity with the first 0.095, with the latter 0.188; the insulating resistance with the former 0.08, with the latter 0.20. These results seem to show that work along the lines of single conductor cables may lead to good results. Tests with special guttapercha cables, using Pupin coils, gave much better results than when using the ordinary guttapercha insulation. This is only true of the Pupin coil cable, though, as here the self inductance that can be given to the cable is unlimited. In the Krarup cable the self inductance can be increased to 5 millihenry only. From this standpoint the Pupin cable seems without objection. But there is another point which is more favorable for the Krarup cable, and that is the matter of simpler repairs, which is especially important for deep sea telephony. Even though the latter show a lower characteristic than the Pupin cable, it may be possible by the use of transformers to eliminate these troubles. Especially if telephone engineers should pass from the double conductor to the single conductor submarine cable, the Krarup cable would offer great advantages, although it must be admitted that the Pupin cable shows better electrical results. In deep sea cables, however, we must look in the first place for mechanical qualities, especially in the line of durabilty and strength, and these factors are better answered by the Krarup than by the Pupin cables.

Tri-State Association Convention at Corinth

The Tri-State Independent Telephone Association held its sixth annual convention at Corinth, Miss., on June 17. From a convention standpoint and the magnitude and scope of the work accomplished, the convention more than did itself justice. The attendance far exceeded any previous meeting. That the association has enjoyed a remarkable growth both in number and popularity was evidenced by the great number of telephone manufacturers' representatives present. The Waldron Hotel at Corinth was selected as the headquarters of the convention. The first session was held there on Tuesday morning, when the general and routine business of the convention was transacted, following which the delegates were provided with many entertaining features which, while of a recreative nature, were nevertheless of instructive and educational value to the delegates. Several men prominent in the telephone field were in attendance at the convention, among them E. C. Lewis of Chicago, who exhibited and spoke of Automanual practice; Frank L. Eldridge of Chicago, who expressed his views on the Telephone Service Association and the work that it is endeavoring to accomplish, and J. C. Kelsey of Chicago, who delivered an address on local financing of independent companies. When the last address had been delivered the convention adjourned to the Waldron, that they could visit the exhibits of the various manufacturers. On Wednesday morning the delegates assembled in the local theater to hear an address by R. M. Wagner of Chicago on the subject of automatic telephone practice and a short talk by J. B. Shannon on the development of independent telephone service in northern Mississippi, at the conclusion of which the convention took up the election of officers. W. H. Bryant of Mobile, Ala., was elected president; J. C. Duncan of Knoxville, Tenn., vice president, and W. W. McAnge of Corinth, Miss., secretary. All delegates present voted that the convention was a great success and all were more than pleased with the manner in which the residents of the city of Corinth extended themselves in providing entertainment and convenience for the delegates.

Claims Telephone Talk is Unlimited

Telephone conversation is not a subject for monopoly within the meaning of the Sherman antitrust law, according to a brief filed in the Supreme Court by the United States Telephone Company.

The brief was in support of a request to the court to review the decision of the federal courts in Ohio that the company's contracts with 300 local exchanges throughout Ohio, Indiana and Illinois are in violation of the Sherman law.

The United States Company claims that telephone companies cannot violate the law, like manufacturers or producers of articles who may control the price by increasing or decreasing the supply. Its position is that the supply of telephone conversation is unlimited and cannot be restrained.

Vermont Companies to Be Investigated

For the first time in the history of the state, the telephone companies of Vermont are to be investigated. Gov. Allen M. Fletcher announces the appointment of Warner A. Graham of Bellows Falls, secretary of civil and military affairs, and Edwin A. Cook of Lyndon, both lawyers, as special counsel to conduct the investigation, which is the result of a petition of subscribers of the New England Telephone & Telegraph Company and subsidiary lines in the northern counties.

Mr. Cook lives in the home town of President Theodore N. Vail of the American Telegraph & Telephone Company. He is a member of the General Assembly and leader of the Progressive party in the House of Representatives.

Oregon Commission News

The Oregon Railroad Commission has granted petitions of the Pacific Telephone & Telegraph Company to discontinue telephone offices in 67 towns. The reasons assigned by the company were that competent agents could not be obtained and receipts were small. All the towns have other telephone service and may be connected with the long-distance lines of the Pacific Telephone & Telegraph Company.

Tests of Lincoln Service

As a result of 15,000 telephone tests made in Lincoln by the investigators for the Nebraska Railway Commission during a nine-day period from May 19 to 27, inclusive, tables have been compiled showing that 60 per cent of the numbers called gave answers without trouble or repeating the calls. The tests were made in business hours, or from 8 a. m. to 6 p. m. each day. The calling was done in most instances from telephones of business establishments.

The commission's assistants made an individual record of every telephone tested. These were turned into the office as fast as collected, and other assistants went to work at once compiling them. The summary just completed is as follows:

Total number of calls, 15,049; number O. K. on first call, 9,053, or 60.2 per cent.

Busy on first call, 1,461, or 9.7 per cent.

No answer on first call, O. K. on second, 987, or 6.54 per cent.

No answer on first two calls, line reported O. K. by trouble operator, 1,750, or 11.63 per cent.

No answer on first call, busy on second, 231, or 1.53 per cent.

First call answered by "information," who reported number discontinued, 216, or 1.43 per cent.

Wrong number on first call, 323, or 2.15 per cent.

No answer on first call, wrong number on second, 110, or 73 per cent.

No answer on first two calls, line reported by operator to be in trouble, 674, or 4.46 per cent.

No answer on first two calls, and no response from trouble operator, 49, or .33 per cent.

No answer on first two calls, trouble operator reporting "no such number," 27, or .18 per cent.

First call answered by information, saying "number changed," 87, or .58 per cent.

First call answered by information reporting phone on dead line, 57, or .38 per cent.

First call not answered, second call answered by information saying "number changed," 24, or .16 per cent.

Buffalo Operators Get Raise

Announcement of a reduction in working hours for operators, decision to pay time and a half for overtime and holiday work and the going into effect of a premium system by which operators will be paid sums ranging from $25 to $100 on anniversaries of their entering the employment of the company has been made in Buffalo, N. Y., by the New York company. George W. Billings of the publicity department, made the announcement. It affects 550 telephone operators in Buffalo. The Bell system is putting this plan into effect throughout the state.

The formal announcement from the company follows:

It is announced that effective June 1st, the New York Telephone Company, acting entirely upon its own initiative, has decided to put in working hours for operators as follows:

Eight hours for day operators, seven hours for evening operators, and time and one-half for Sundays and holidays.

In addition, a system of anniversary payments is to be inaugurated. Under this section of the plan, an operator who has been in the service two years will receive at the expiration of that period an anniversary payment of $25. If she elects to remain with company three years, she will receive at the expiration of the third year an anniversary payment of $50. The $50 payment will also be made at the expiration of the fourth, fifth, and sixth years. If the operator continues in the service she will begin to receive at the end of her seventh year with the company anniversary payments of $100 per year from that time on until she leaves the service.

Physical valuation of telephone lines and plants in Montana as a basis on which rates to subscribers should be fixed will engross the attention of the Bull Moose organization of Lewis and Clark county.

Grand Rapids Company Makes New Plans

At a meeting of the directors of the Citizens' Telephone Company of Grand Rapids, Mich., a new financial plan was adopted by the company, necessitated by the recent supreme court decision, requiring the company to pay into the state treasury the sum of $134,000 accrued taxes.

Essential features of the plan include a bond issue of $750,000 or $1,000,000, of which only enough will be issued at this time to pay the accrued taxes and a floating indebtedness of about $150,000, the balance to remain in the treasury and to be issued as funds may be needed for improvement or construction.

To close the stock books against the sale of any additional stock, the present issue being about $3,800,000.

It is also more than likely that the annual dividend rate of 8 per cent will be reduced to 6 per cent. Stockholders may receive the 2 per cent, to which they have been accustomed in August, and with it, a notice of the intention to reduce the rate to 1½ per cent quarterly at some future definite time.

Indiana Commission News

At its first meeting the Indiana Public Utility Commission voted to adopt the Wisconsin system of accounts for all public service corporations, except where the Interstate Commerce Commission has provided a uniform system of accounts. This means that all telephone companies having an annual gross income exceeding $50,000 will use the Interstate Commerce Commission's schedule of accounts and those having an annual gross income of $50,000 or less will be governed by the Wisconsin schedule.

The Commission has received a petition from the Home Telephone and Telegraph Company of Ft. Wayne, which asks the commission to uphold the company in certain increases of toll rates it says it has been called on to put in effect for a line of independent telephones between New Haven and Ft. Wayne. The smaller line, operated principally by farmers, had asked the commission to prevent any increase in rates of the Ft. Wayne company.

Rate Raise Not Protested

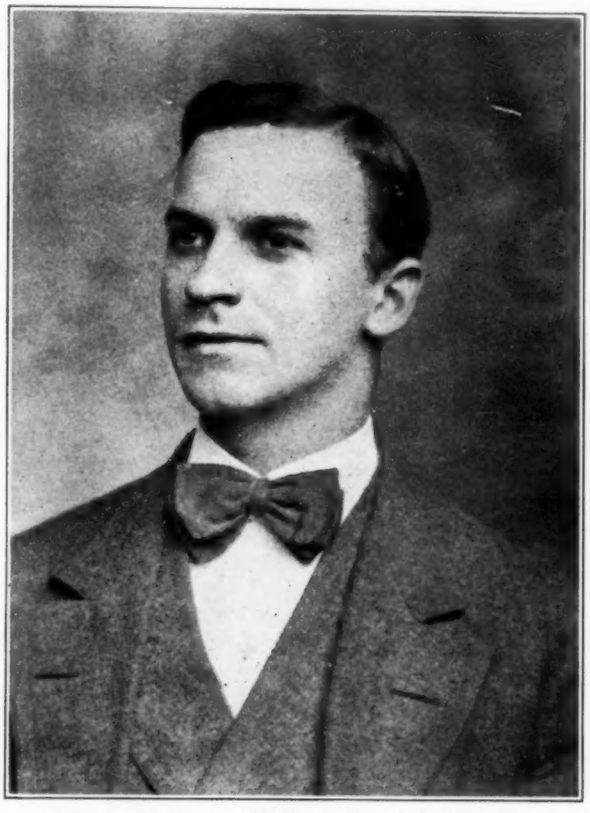
Apparently the telephone users of Rome, N. Y., are not much disturbed over the proposed raise of rates by the New York Telephone Company, for at a protest meeting in the common council chamber only about one of each 1,000 residents was present, even the manufacturers, the Chamber of Commerce and the Merchants' Association being without representatives. The committee named to get the figures of cost of operation of the local exchange reported figures prepared by the company, which showed that at present the total annual expense was $49,297.24, and the annual revenue $46,697, leaving a loss of $2,624.24, while under the raised rates the annual revenue would be $54,832, an annual profit of $5,534.76.

Sticking to his promise to have no girls in the municipal telephone exchange, Commissioner William H. Bartlett, of Atlantic City, who is a bachelor, named Edward Heller and Willis Gale, at $75 a month each, to take charge of the new telephone system. The director says the police have secrets that must be kept.

Who's Who in the Telephone Game

Facts and Fancies About a Man You Know or Ought to Know

HE drew the legitimate title of tow-head at birth, and he holds full and undisputed claim to it even yet, with the proof in evidence. Then, too, he was one of those wiry little mites who concentrated abundant energy on new and untried schemes to terrorize his parents, incorporating himself into the noisiest urchin of 'em all—gowing for six months, yelling for a year and then singing till he was hustled off to school. Blonde babies are usually like that, especially the boys. At six they started him off to kindergarten, which was a pity, for the joy in him went out—at least that exuberance which had hitherto declared itself so enthusiastically and persistently. School days put on the damper. Discipline symbolized more, backed up by an ebony ruler, than it had meant around home and in the back lot, where there wasn't a convenient wood-shed. Besides there isn't the same sense of humor in a school teacher as there is in a parent. Especially is this true of a city school teacher. For this musical and joyous child was city born and city bred. And it was in that city where discipline hangs hard on the heads of little folks even unto this day—where the recitation mark along the side of the room is real instead of imaginary—where the boys play in brick-paved enclosures separated from the girls, and where they sit erect on their side of the house and are sent up to the superintendent when they are due for a licking. St. Louis schools are something for pupils to remember!



He is Gentle and Mild-Mannered and Soft-Voiced.

And it was in St. Louis that Will Benoist was born, not so many years ago, and where he fulfilled the traditions of blonde babies and where he started to school at six, whether in the old Henry Ames or not, and where he eventually graduated from the manual training department of Washington University. As nearly as memory will help to serve, he got his sheepskin when he was twenty, for it was at that age he entered the telephone business, engaging with the Kinloch Long Distance Telephone Company. From manual training to training manually was a fairly good beginning for a youth of twenty and there might have been worse places to start than with the Kinloch. Young Benoist went in as a record clerk and as a clerk for a record, but he was so quiet and regular and careful that the management never knew till they tried, so they kept trying. By this curiosity, Benoist was advanced to cashier and then to auditor and, after a time, to assistant secretary. In the meantime he served as auditor for the Union Electric Light and Power Company. From which it may be observed that W. F. Benoist had qualified with a capital Q with Charles H. Ledlie, at least, who was general manager and chief engineer of the corporations named.

It may also be deduced that Benoist didn't fare so badly when school days knocked his hilariousness into the discard. For he isn't that any more. Benoist isn't boisterous or big or brawny. He is gentle and mild-mannered and soft-voiced. Given an assignment, he vanishes, to reappear shortly with the schedules in apple-pie order. He would have made a splendid soldier, but the rear ranks are for those short in stature, and he never entertained that thought. Being short in inches never meant much to him.

In 1905, when Mr. Ledlie resigned from Kinloch to engage in engineering work on his own account, Will Benoist resigned from Kinloch, too, to take on the assignment of Mr. Ledlie's first assistant. This position, differing somewhat from accounting, is in some respects akin to it, but there were diversions. Benoist was making physical and financial reports on public utility properties scattered about in various parts of the country. Included in his studies were telephone, electric and water power plants. It was a practical and delightful change which led eventually to his present connection.

Four years ago W. F. Benoist joined the Automatic Electric Company, Chicago, as assistant general sales manager and, with the exception of a brief period, he has held the place ever since. This exception lasted five months, during which he was granted leave of absence at the request of the Subway Construction Company to assist in directing the work of completing the automatic telephone system in Chicago. During this time, Mr. Benoist was acting as assistant to the president of the Illinois Tunnel Company, which is set down here to show that Benoist either finds

things to do or his associates have a happy faculty of discovering odd jobs to occupy his attention while about.

However, it is a far cry from manual training to automatic operating. Benoist reserved his enthusiasm for full automatic until after he married. He has an added handicap in his baby daughter, Elmira Lee, but even so, he believes that telephone operating is a machine job. He believes this all the time, day and night and Sunday, and he dreams it when his Victrola is playing the seven-dollar records.

William Francis Benoist was born August 5, 1881, at St. Louis. He married Adelaide Garesche, also of St. Louis, November 17, 1906. Besides Baby Elmira, aged 1, Edmond Garesche Benoist, aged 5, is performing the usual towhead antics about the house in Chicago's northwest side. The photograph was taken several years ago and was filched out of the album when Mrs. Benoist's back was turned. There is a prize offered for the correct pronunciation of Benoist. No attention paid to letters not including stamps.

San Francisco Rate Reduction Protested

Suit to restrain the board of supervisors and Mayor Rolph of San Francisco from putting the new telephone rates into operation July 1 was filed by the Pacific Telephone and Telegraph Company in the United States district court. The complaint alleges that the operation of the new ordinances, one passed by the supervisors and the other voted at the April election, would be confiscatory in nature and in violation of the fourteenth amendment of the constitution of the United States, which provides that no person shall be deprived of property without due process of law.

The company states that May 1, 1912, the property of the corporation was valued at $16,406,439. For the fiscal year ending June 30, 1914, the company's operating expenses will be $2,761,630. Attention is drawn to the constant depreciation in the company's property and insists that a rate should be fixed that would insure a gross income for the next fiscal year of $4,959,240.87.

Under the ordinance passed by the supervisors the company alleges that it would receive $477,562 less than under the present rate. It also contends that two ordinances will be in operation after July 1 and insists that it can not meet the requirements of two ordinances at the same time.

Missouri Commission News

The Kansas City common council has filed a petition with the Missouri Public Utilities Commission requesting that it compel the Home and Missouri & Kansas Telephone Companies at Kansas City to establish interchangeable service at the rate now charged by either. The petition says it is reported that the same interests control both telephone concerns. This has been denied by the Missouri & Kansas Telephone Company. The commission made no order.

California Commission News

A decision was rendered by the California Commission granting authority to the Union Home Telephone & Telegraph Corporation to issue $161,000 of bonds to replace borrowed bonds. The company operates in Southern California.

Abusing the Operator in Germany

The woes of telephone subscribers all over the world appear to be much the same, and to lead to a strong desire to say unkind things to the telephone girls. Our laws regarding insult work out occasionally in ways that appear ridiculous, but they have their uses, and one of them is the protection of operators from the irate telephone subscriber who gets abusive when he is kept waiting longer than he considers proper, or who is convinced that the girl is too lazy to give him the connection desired when she tells him the line is busy.

A Berlin attorney named Paechter has just had this borne in on him forcibly in an action brought against him for insulting two telephone girls and the postal authorities in general. Paechter, an excitable man, had formerly had considerable trouble with the postal authorities over the telephone, and it had been taken away once because he abused the exchange employes. On his promise to be good the telephone was restored to him. A few days later a number of indignant young women complained of Paechter's language to them, and the director of posts had the attorney's connection taken out. "The post has a sense of justice like a Hottentot's," said the irate Paechter, thereby adding another count to the charges against him.

At the trial the girls from the exchange testified that they had been saluted with phrases like these:

"Get off the line, you camel!"

"Answer sooner, you calf!"

"Pay attention to me, common female person [gemeines frauenzimmer]!"

Paechter admitted some of the epithets charged, but offered to justify them by proving facts tending to excuse his irritation. He would prove, he said, that one of the chief delights of the girls at the Luetzow exchange (his exchange) was to connect any person demanding a subscriber named Cohn with all the Cohns of the exchange, and then to enjoy the despairing efforts of the bewildered subscribers to find out which of them was wanted. The task was considerable, inasmuch as there are seventy-five Cohns connected with this exchange Paechter offered also to prove that lines were free when they had been reported engaged, that he had been kept waiting deliberately because the girls did not like him, and other shortcomings at the exchange.

The court refused to admit the testimony, holding that it was immaterial, since no conduct by the exchange employees could justify the epithets applied to them. An alienist, however, was permitted to testify that Paeschter is a very excitable man and that the telephone is a dangerous irritant to many persons. The witness even declared that a physician whom he knew had become mentally deranged solely through anger at poor telephone service.

The attorney was fined 260 marks and costs amounting to about as much more. To this punishment must be added his loss during seven months in which all connection was denied him.

The Mountain States Telephone & Telegraph Company, according to a decision by Judge Denison, has no franchise in Denver, and has been operating by reason of sufferance since 1909.

The decision was given in the quo warranto procedings against the telephone company by O. Clinton Wilson, as a taxpayer of the city of Denver. W. H. Bryant and John A. Rush, district attorney, fought the case through the court.

The Law and the Telephone

By E. J. Wenner

DELAYED DELIVERY OF MESSAGE—AGENCY—USE OF TELEPHONE BY SENDER—LIABILITY FOR NON-DELIVERY OF MESSAGE—DAMAGES FOR MENTAL ANGUISH.

ON NOVEMBER 28, 1906, Stephen Markley, a resident of Glidden, Iowa, sent a telegram to Calvin Markley at Plattsmouth, Neb., of which the following is a copy:

By telephone 9:10 p. m. Glidden, Iowa, 11-28-06.

To Carroll Markley, Plattsmouth, Neb.: Mother not expected to live until morning. Come at once.

9:45 p. m. S. MARKLEY.

The first name of the addressee was given as Carroll instead of Calvin, and the mistake was made by the Glidden agent of Western Union Telegraph Company. The message was given the company by means of a telephone, and after it was written by the agent it was read to the sender and by him pronounced as correct. He claims the name of the addressee was given Calvin Markley.

The message was not delivered to plaintiff until the forenoon of December 31 and he left by the first train for the bedside of his mother. He did not reach her until after her death, but was present at the funeral.

He brought action against the defendant to recover damages for mental anguish on account of alleged negligence on the part of the agent in making a mistake in the name, which caused delay in the delivery of the message. The action was twice before tried and reversed in the supreme court, this being the third appeal from the District Court of Carroll county, Iowa. The following is quoted from the opinion of the supreme court:

As bearing upon several questions which arise in the case, we consider, first, that which relates to the use of the telephone in sending the message to the defendant, to be forwarded to its destination. On the part of the appellant is it claimed that in receiving, the agent of the defendant at Glidden was acting as the agent of the sender, S. Markley, and its liability could not arise for negligence on the part of its agents in the transmission and delivery of the message after being so received.

There are court decisions to support the contention of the defendant, also decisions to the contrary. The defendant company had in its office in Glidden a telephone, over which the message in controversy was received by its agent, to be forwarded. It is contended that in receiving the message over the telephone the opertor was acting for the sender, and if there was any negligence in receiving or transmitting the message for sending that such could not be charged to the defendant. The cases holding the contrary doctrine are made to rest upon the principle that if by the installation of a telephone in its office a means of communication with it is afforded, by which messages may be sent to it for transmission, and if such means is employed, in the absence of a showing of a rule to the contrary, known to the sender, the act of the agent in receiving the message for transmission is the act of the telegraph company. The defendant is not bound to keep a telephone in its office, over which messages may be sent to it to be forwarded. If it does so, it must be held to the exercise of reasonable care in thus receiving messages. It had the right to require all tendered messages to be in writing, and to make such reasonable rules as might be necessary for its own protection and for the accurate care of its business; but, in the absence of any showing that there were such rules, which were known to the sender of the message, it must be presumed that the use of the telephone was a means permitted by it to be employed in receiving messages for forwarding. So permitting it, if there was a negligence on the part of its agent in receiving the message, such would be the negligence of the defendant. There was dispute in the evidence as to whether the message, as finally sent, was the message received by the agent, and adopting the theory of the law, as above stated, the lower court upon proper instructions, submitted the question of fact to the jury.

Finding no prejudicial error, the judgment of the lower court is affirmed.

Markley v. Western Union Telegraph Company (Iowa), 141 *N. W. Reporter*, 443.

MASTER AND SERVANT—ASSUMPTION OF RISK—INSTRUCTION OF SERVANT—NEGLIGENCE.

While Howard Elliott was in the employ of defendant, he came in contact with high voltage electric wires among which he was working at the top of a pole, and was instantly killed. This is an action by his mother as administratrix of his estate to recover resulting damages in the sum of $25,000. Upon a verdict of a jury judgment was rendered in favor of plaintiff for $7,500. Defendant has appealed.

The following is quoted from the opinion of the supreme court:

Elliott ascended the pole by means of spur climbers and, to prevent falling, fastened himself to the top with a belt. With the upper part of his body between the north power wire and the one next to it, and his left foot near the trolley bracket and the copper wire, he had taken a position on the east side of the pole intending to unscrew the nut from the bolt which held the crossarm in place, and to assist in raising the crossarm on extension arms already bolted to the pole. He carried a metallic brace and bit, either attached to his belt or in one hand. A fellow servant on the west side of the pole a little lower down handed him a 12-inch iron monkey wrench. He took it for the purpose of unscrewing the nut at the top of the pole. There were sputtering sounds. The brace and bit fell to the ground. His body swung from his belt.

The defendant claimed that Elliott assumed the risks of his employment, and that he had full knowledge of the conditions under which he worked and the danger to which he was subject. Defendant's manager admitted that Elliott told him before he hired him that his line experience had been entirely with telephone wires, and that he had not worked with wires carrying high voltage. The manager testified to having instructed Elliott, though from his testimony the court drew the inference that the instructions were only general and not sufficient for one who had no previous experience with high power wires. The foreman worked near the deceased and admitted on examination that he had asked of the danger and that he gave Elliott some instructions. The court observed that if Elliott had represented to the manager and foreman that he had previously worked with high power wires and knew of the danger, that the instruction to him was sufficient, but if all previous experience had been confined to telephone lines, the instruction was not sufficient and the defendant was liable in damages on that account, they say, "when all the circumstances are considered, the evidence is sufficient to sustain a finding that Elliott's knowledge, experience, and representations did not, under well-settled rules of law, prevent a recovery on the ground that he assumed the risks to which he was exposed. The question was one for the jury."

Elliott v. General Construction Company (Nebraska), 140 *N. W. Reporter*, 1024.

Pipe Line Telephone System in Mines

A telephone system to work from the interior of a mine to the surface of the ground by means of a pipe line system is the idea gathered from an eminent German electrical engineer. This can be done by simply connecting one side of the telephones to any metal arrangement such as a water pipe, rails or cables while the opposite side of the telephone is connected to the earth—in spite of the fact that all the piping, etc., is already in connection with the earth. From an economical standpoint and especially from a mining standpoint this system has advantages over many others in so much as there is no wiring or insulations to make.

A battery that will supply 12 volts to generate a current for the microphone is all that is necessary, when accompanied by an induction coil to be used in the secondary circuit. The ordinary telephone can be employed as a receiver. In this system, where the only function of the conducting path is the transmission of the telephone current, a signal system such as an electric bell cannot be used; but in this case the monotelephone relay apparatus can be used to good advantage. This apparatus consists of a metal-disk which vibrates when current is permitted to come into its magnet, which causes the movement of a light arm to come in contact with an electric battery that will ring a bell. Thus the signals can be created by the telephone itself. Either permanent or portable telephone outfits can be so used in the mines, this depending entirely on conditions in the mine itself. Elevators in mines may be equipped with telephones of this description by simply using the cable as a connection.

Exposition to Have Perfect Telephone System

The last word in telephone perfection, both in the service that it will render and in the equipment that will be used, is the proposed system that the Pacific Telephone and Telegraph Company expects to install in the Liberal Arts building of the Panama Pacific International Exposition. A switchboard gigantic in size will be built in the center of the building, from which thirty operators will be able to connect every department, exhibit and business within the exposition grounds, besides being able to give an efficient service to both local and long distance connections. In order that visitors at the exposition may enjoy the maximum in telephone service and convenience over two thousand stations and public booths will be installed in the different buildings.

A point of added interest to the visitors at the exposition will be the huge glass case in which the switchboard will be enclosed. Around this glass case a brass rail will extend. This arrangement will enable visitors to the exposition to view the operation of a call delivered to the main station from which the connection is made to the party called.

The Telephone Pioneers of America will hold their third annual meeting at Chicago on October 16, 17, and 18. Among several of the prominent men in telephone affairs of the day who are expected to address the meeting are B. E. Sunny, president of the Chicago Telephone Company who will make the address of welcome; N. C. Kingsbury, Thomas B. Doolittle, and M. J. Carney. The entertainment features of the meeting will be taken care of by the Plan and Scope Committee, which consists of A. S. Hibbard, Frank E. Ketcham and B. E. Sunny.

South Dakota Commission News

The South Dakota Railroad Commission has commenced an investigation, and 125 telephone companies, with 131 representatives, appeared at the investigation. This comprised a definite inquiry into the discrimination in the matter of charges for telephone service to stockholders and those who are not; extra charges for delivering toll messages on local exchanges and rural lines; discrimination in switching charges and connection fees and terminal charges; discrimination in furnishing free telephone instruments and telephone service in connection therewith.

More than two-thirds of the managers were placed on the witness stand and were questioned as to their methods of making connections for parties living on rural lines and those living in the city. It developed in the examination that it has been the custom of many companies to permit farmers living on the rural lines to have connection with city telephones without charge, but if persons residing in the city desired to talk with those in the country a charge of 10 cents was made. It was shown that discrimination was made by permitting one telephone company to make connections with an exchange and to impose a charge on another, and a great many other irregularities were uncovered.

After the commission secures all the evidence and it is gone over thoroughly it is very likely that some rules and regulations will be made by the commission which will harmonize the telephone business of the state, and put it on more of an equality.

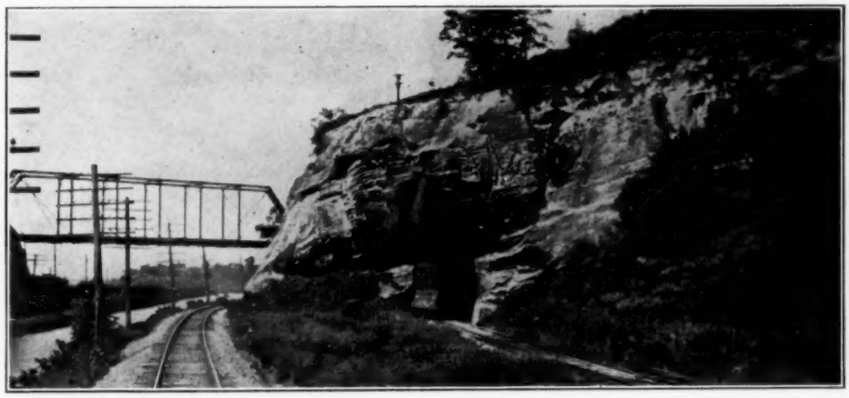
Kansas Commission News

An order providing for joint telephone and telegraph service in Kansas has been handed down by the Kansas Commission. The installation of such joint service is optional with the telegraph companies; as they are given full rates on all messages by the commission's order, it is probably safe to say that the action of the commission means telegraphic connection anywhere at any time for telephone users.

Besides authorizing the Missouri and Kansas Telephone Company, and all other telephone companies in the state, to enter into contracts with the telegraph companies in the state for joint transmission of messages over telephone and telegraph lines, the commission further ordered that all telephone companies that have rates filed with the utilities commission, upon request of the telegraph companies, must enter into contract for joint service.

The application for joint service originally was made to the commission by the Missouri and Kansas Telephone Company. The joint service order means that in cities and localities where there are not telegraph offices, or where there is only a day office, messages may be telephoned to the nearest open telegraph office, and the message must be sent in due order, as though it had been filed at the office, at the regular telegraph rate, plus the following reduced telephone rates:

Full telephone charges where the regular telephone toll rate is ten cents for the first three minutes; 80 per cent of the usual telephone charge where the rate is from ten to fifteen cents for the first three minutes; 70 per cent of the usual telephone charge where the regular toll rate is twenty to twenty-five cents for the first three minutes; 60 per cent of the usual telephone charge where the regular telephone toll rate is thirty cents or more for the first three minutes.



DEPARTMENT of RAILWAY TELEPHONES

Big Increases in Telephone Dispatching

2,200 Miles Added

THE success attending the adaptation of the telephone to train dispatching work a little over three years ago may be measured by the fact that at the beginning of 1913, there were about 70,000 miles of road in the United States and Canada using this method of controlling the movements of trains. Changing over from one method of train dispatching to another is a process which necessarily entails a great deal of deliberation on the part of railroad officials and such a radical change as that from telegraph to telephone requires considerable time for its consummation. The fact that 70,000 miles out of a possible 265,000 or over 30 per cent have been equipped with telephones in the comparatively short space of four years is indisputable evidence of the good work being done with the new system. Since the beginning of the year, apparatus for a large number of extensions to existing equipments has been ordered and a number of other railroad systems have placed orders for their first telephone lines.

The Iowa Railway and Light Company which operates the Cedar Rapids and Iowa City Railway, has ordered telephone train dispatching apparatus for equipping its entire line. This railroad system runs from Cedar Rapids, to Iowa City, Iowa, a distance of approximately thirty miles, operating its passenger trains by electricity and freight service by steam. Ten way stations will be equipped with telephones and selective signaling apparatus. No. 102 selector sets containing the Western Electric No. 50 type selector will be used for signaling way station operators. Portable telephones will be furnished for the use of train crews. These telephones will be fitted with cords and plugs arranged for plugging into pole jacks which will be placed at a convenient height on telephone poles along the right-of-way. This arrangement will make it possible for train crews to communicate with headquarters from any point on the line, and is especially valuable in emergencies. The train dispatcher will be located at the Cedar Rapids office of the Iowa Railway Company.

Another road which has recently joined the ranks of those dispatching trains by telephone is the Lehigh and New England Railway Company. The total mileage which is to be equipped at present is approximately 120. The remainder of the line will be equipped at a future date. The present telephone circuits will extend from Lansford to Hainsburg Junction, Pennsylvania, with spurs running from Benders Junction to Bethlehem and from Bath Junction to Martin's Creek. The dispatcher will be at Bethlehem. Twenty-one way stations will be equipped with telephones and No. 101-B selector sets containing the No. 50 type selector for the selective signaling. There will also be sixteen siding telephones of the Western Electric No. 1317 type installed at points along the line. The No. 1332 type portable telephone is to be carried by train crews.

The Seaboard Air Line has placed an order for Western Electric apparatus to be used in extending its telephone dispatching circuits from Columbia, South Carolina to Jacksonville, Florida, a distance of approximately 285 miles. A total of thirty-four way stations has been equipped with desk type telephones and selector sets for signaling. The dispatcher is located at Jacksonville.

Seven circuits are to be equipped on the Missouri, Kansas and Texas Railway, making a total of 1,000 miles of new telephone lines. Way stations will be equipped with No. 101-B selector sets for selective signaling and No. 1048 telephone arms of the folding gate type for talking. The divisions to be equipped are as follows:

Muskogee division extending from Osage to McAlester, Oklahoma, a distance of 186 miles with the dispatcher at McAlester. Twenty-three way stations will be equipped.

San Antonio division extending from San Antonio to Smithfield, Texas, a distance of 101 miles with the dispatcher at Smithfield. Eleven way stations will be equipped altogether.

Department of Railway Telephones

This department is established as a permanent feature of TELEPHONE ENGINEER. The progress of the art of telephone train dispatching, its technical development, its news, and the elucidation of its mysteries for the non-technical worker will be found each month in these pages. The editors invite the problems and solicit the co-operation of the many readers of TELEPHONE ENGINEER in all parts of the world whose interests lie along these lines.

Big Increases in Telephone Dispatching..... 39-40
C., B. & Q. Telephone Increase..... 40
Inductive Disturbances on Telephone Lines. By P. J. Howe..... 41-46
Katy a Big Telephone User..... 46
Protecting Telephone and Telegraph Lines. By M. H. Clapp.... 47-49
Multiplex Telegraphy and Telephony. By W. R. Birt..... 50-53

Houston division extending from Houston to Smithfield, Texas, a distance of 117 miles with the dispatcher at Smithfield. Thirteen way stations will be equipped.

Sedalia division extending from Sedalia to Parsons, Missouri, a distance of 160 miles, with the dispatcher at Parsons. Twenty-eight way stations will be equipped.

Kansas City division extending from Kansas City to Parsons, Missouri, a distance of 107 miles with the dispatcher at Parsons. Nineteen way stations will be equipped.

St. Louis division extending from St. Louis to Sedalia, Missouri, a distance of 227 miles with the dispatcher at Sedalia. Thirty-three way stations will be equipped.

Cherokee division extending from Wagoner, Oklahoma, to Parsons, Missouri, a distance of 102 miles with the dispatcher at Parsons. Sixteen way stations will be equipped.

The Missouri, Kansas & Texas lines will also be equipped with 150 siding telephones of the No. 1293 type. Wire chief's test panels and apparatus cabinets equipped with simplexing relays, resistances and protectors for the dispatchers' offices will also be furnished.

Two new telephone train dispatching circuits have been added to the lines of the New York Central. One circuit extends from Oswego to Rome, New York, with a side line bridged on at Richland and extended to Watertown, making a total mileage of 101. Twenty-three way stations are equipped with telephones and Western Electric No. 102-B selector sets. The dispatcher is located at Oswego. The other circuit extends from Oswego through Richland to Syracuse, New York, a distance of 70 miles. Eighteen way stations are equipped with telephones and selector sets for selective signaling. The dispatcher for this circuit is also located at Oswego.

Additions to existing circuits are to be made by the Chicago and Northwestern Railway Company. One new telephone dispatching line is to extend from South Pekin, to Benld, Illinois, a distance of approximately 105 miles. Twenty-three way stations are to be equipped with telephones and No. 102 type selector sets for the selective signaling over this new division of road. A message circuit for handling telephone traffic other than train dispatching will be installed over the Peoria division and will extend from Nelson to South Pekin, Illinois, a distance of about 85 miles. Eighteen way stations will be equipped with telephones and selective signaling sets. The dispatchers for each circuit will be located at South Pekin. Thirty-eight waiting room telephones are to be installed in the stations along these two divisions.

The Chicago, Burlington and Quincy is planning to add three new train dispatching and one message circuit and has placed orders for the necessary apparatus. The message circuit and one of the train dispatching circuits will be installed over the division extending from Burlington, Iowa, to Hannibal, Missouri, a distance of approximately 100 miles, with the dispatcher at Hannibal. A total of twenty-two No. 102 type selector sets and telephones will be furnished for the way stations along the line. Another of the train dispatching circuits will be installed between Alliance and Ravenna, Nebraska, a distance of about 240 miles. The dispatcher will be located at Alliance. Twenty-seven way stations will be equipped with telephones and selective signaling apparatus. Apparatus for one blocking circuit will also be furnished with twenty-five station equipments. This provides for making connections between different circuits and connecting telephone sets to train, message or block wires in either of two directions. The third train dispatching circuit is to extend from Creston to Pacific Junction, Iowa, with the dispatcher at Creston. This division, which is about 65 miles long, will have twenty-three way stations equipped with telephones and selector sets for signaling.

The Denver and Rio Grande Railroad has purchased a quantity of composite equipment for use on its lines. This equipment consists of seventy-two wall sets of the Western Electric No. 1312-A type for use at way stations and twenty-six No. 1314-A portable sets for the use of train crews. These portable sets are equipped with cords and line poles so that communication may be established with headquarters from any point on the line by merely hooking the line pole over the telephone wires which parallel the track.

These new installations add a little over 2,200 miles to the already large mileage over which the dispatching of trains, both passenger and freight, are governed by means of the telephone. The railroads have also found it profitable to install telephones for the handling of its communication other than dispatching messages. Roads already using this method of communication over a part of their right-of-way are constantly adding to their equipment. Almost as fast as installing work is completed on one division, it is begun on another. Many other roads are rapidly joining the ranks of telephone users.

C. B. & Q. Telephone Increase

The use of the telephone for controlling the handling of trains is largely displacing the use of the telegraph and among the railroads which have recently put in a large order for telephones is the C., B. & Q.

The many advantages accruing from the use of the telephone instead of the telegraph for the dispatching of trains, alone were responsible for its adoption. The telephone, in the first place, is quicker. It has been observed that the ring of the bell will insure a prompt answer, and for this purpose large so-called "extension" bells are used, which can be heard several hundred feet away. In the four years that the telephone has been used for dispatching not a railroad accident has been laid to its door, so that it may be said to be as safe as, if not safer than, the telegraph. Furthermore, it has been made possible to increase the length of a division handled by one dispatcher by as much as 50 per cent.

The telephone, making possible, as it does, direct personal communication by word of mouth between the dispatcher and the men under him, has the effect of a warm, hearty handclasp every time it is used. A spoken sentence, even when an order, is infinitely more inspiring and impressive than a succession of cold and formal dots and dashes, and it is this feature as much as any other which has made for the success of the telephone as an improver of discipline and increaser of efficiency on railroad systems.

At the beginning of 1913, there were about 70,000 miles of road in the United States and Canada using this method of controlling the movement of trains. Changing over from one method of train dispatching to another is a process which necessarily entails a great deal of deliberation on the part of railroad officials and such a radical change as that from telegraph to telephone requires considerable time for its consummation. The fact that 70,000 miles out of a possible 265,000 or over 30 per cent have been equipped with telephones in the comparatively short space of four years is indisputable evidence of the good work done with the new system.

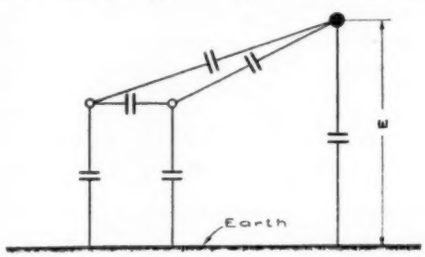
Inductive Disturbances on Telephone Lines

By P. J. Howe*

THE purpose of this paper is to call attention to the possibilities of inductive disturbances in telephone and telegraph lines and to describe the manner in which these disturbances take place. The conditions which are liable to cause trouble will be discussed and also various arrangements of circuits or apparatus which will either prevent or restrict the inductive effects.

Growth of Electric Power and Railway Industries.—The electric transmission and railway industries have grown very rapidly during the last ten or fifteen years. The number of lines has been multiplied, the circuits have been lengthened, the voltages raised, and the amounts of energy transmitted increased. Single phase alternating current has been applied to electric railway operation and is being rapidly extended. At the same time nearly every important extension of the alternating current electrical industry has brought its harvest of induction troubles for the telephone and telegraph engineers. The future does not hold out any promise of less interference for them. Instead, it indicates that the electrical industries will advance even more rapidly than in the past. Therefore the telephone and telegraph companies must face the problem of an ever increasing number of "inductive disturbances" on their lines.

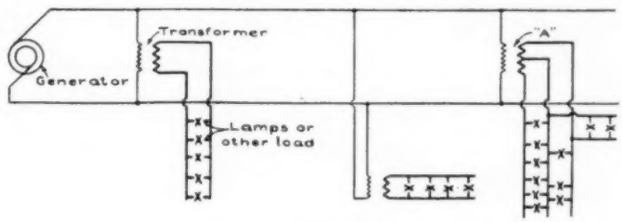
Location of Power Lines.—The business of power transmission and interurban electric railway companies is to transmit power or provide transportation from one point to another. The precise route of their lines is not of great importance, except as a matter of economy. Recent years, however, have seen a tendency for the power and electric railway engineers to locate their lines on or close to railroad rights of way. Some of the reasons which may argue for this choice of location are the most direct route, cheaper right of way, cheaper maintenance of their lines, and less public opposition than if the lines



CAPACITIES BETWEEN LINE WIRES
Fig. 1.

were built along public highways or through private property.

On the other hand, most of our telegraph lines and many telephone lines are either close to or on railroad rights of way. The operation of a closely paralleling high tension transmission line or alternating current electric railway is almost certain to have inductive effects on the telephone and telegraph wires. In some cases this induction will cause disturbances that will work a real hardship on the company operating such lines. Another source of trouble is the hazard to life and property that is often created by the erection of high tension lines so close to telephone or telegraph lines and railroads, that there is a possibility of physical contact with the high tension wires. For these reasons, the location of power lines and electric railways close to railroad rights of way is very objectionable to the telegraph company. It should also be so considered by the railroad companies which have their own telephone and telegraph systems to maintain. If, therefore, the position of the telegraph company is properly presented to a power or electric railway company before its right of way is secured, it will often



SINGLE PHASE DISTRIBUTION SYSTEM
Fig. 2.

be found practicable to locate the line where it will not be unsatisfactory to the telegraph company, and thus to avoid all the trouble which might otherwise be caused.

INDUCTION.

General.—Inductive disturbances are the result of two different phenomena, electro-magnetic and electrostatic induction. Both effects may be present on a circuit and nearly equal, although it is more usual to find one effect stronger than the other. In order to better explain the various methods of overcoming these inductive effects, a brief outline of the theory of induction will be given. No attempt will be made to derive or state the mathematical formulae by which induction may be calculated, as it is desired only to explain the factors of induction in such a way that the result of any changes in a disturbed or disturbing system may be approximately foretold.

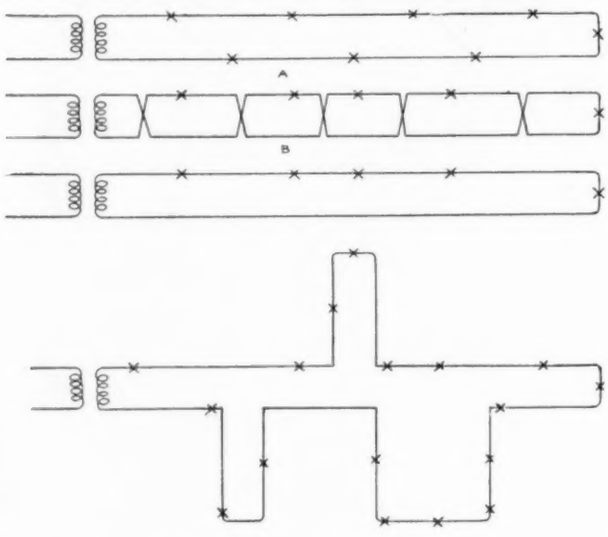
Electro-Magnetic Induction.—When an electric current flows in a conductor, there is set up a magnetic flux or field in the region surrounding the conductor. This field is considered as composed of circular lines of force surrounding the wire. These lines change with every change of current, expanding when the current increases and contracting when it decreases. If a second conductor is placed in parallel relation with the energized circuit, every change in the field of the first conductor will cause the field to cut across the second conductor. It is this cutting of a conductor by magnetic lines of force that induces an electro-motive force in it and gives rise to electro-magnetic induction. The more intense the magnetic field and the more rapid its rate of change, just that much greater will be its effect on other conductors.

The strength of the magnetic field surrounding a conductor is directly proportional to the current. When the current is alternating, the field goes through a complete cycle of changes with every cycle of current. The rate of change of the field intensity is proportional to

*Paper read before the annual convention of Association of Railway Telegraph Superintendents.

the frequency, and is affected to a certain extent by the wave form. The strength or density of a magnetic field is the greatest at the surface of a conductor, and at more distant points varies inversely as the distance from the center of the conductor. The voltage induced in a paralleling wire depends upon the field strength, which is proportional to the current, and upon the frequency, the length of exposure and the separation. The effect of separation varies with the logarithm of the distance.

When there are two disturbing wires carrying equal currents but in opposite directions, the magnetic field surrounding one of the wires will be in the opposite direction to that surrounding the other. These opposing fields result in more or less neutralization of the induction in other wires, the neutralization being more complete as the two conductors come closer together. In this way, there is always a certain amount of neutralization



Series Arc Lighting Circuits
Fig. 3.

of the induction from metallic alternating current circuits.

Electro-Static Induction.—Considered electrically, any two wires which are supported in the air and insulated from each other and the earth may be regarded as two plates of a condenser. Air is the dielectric or insulating medium. Similarly, each wire forms one side of a condenser, of which the ground forms the other side. When, therefore, an electro-motive force is applied to one of several wires, as shown in Fig. 1, the difference in potential between that wire and ground will cause an electro-static charge to be induced on the other wires. If the source of energy changes, or reverses, as in the case of an alternating current, the charges induced in the other wires will change accordingly. Every reversal of the disturbing voltage will cause a similar reversal in sign of the induced charges. It is the flow of current resulting from these changes in static charges that gives rise to what is called a charging current, the cause of electro-static disturbances.

The electro-static charge on a conductor varies directly with the voltage applied to the disturbing wire. The potential of the charge depends on the ratio of the wire's respective capacities to the disturbing wire and to earth. The magnitude of the charging currents, however, depends on this potential, and also on the magnitude of these capacities or condensers. By reason of these facts, the static potential induced in a conductor is independent of the length of exposure, assuming perfect insulation, while the charging currents, and therefore the disturbances, vary directly with the length of exposure. Static disturbances also vary with the frequency of the disturbing source, being much greater when the applied voltage is of high frequency or contains several high frequency components.

Just as magnetic induction is neutralized by equal and opposite currents in wires that are near together, so is static induction neutralized when there are two disturbing wires having equal but opposite potentials to earth. In this case, the charge induced by one wire is opposite to that induced by the other, the completeness of the neutralization depending on the closeness together of the disturbing wires, compared with their separation from the disturbed wires.

It has been shown, in the above, that electro-static induction depends largely on the capacities which conductors have to each other and to ground. Every conductor, however, has a capacity to every other conductor and structure. Therefore the capacity between any two wires, or between any wire and ground, depends to a certain extent on the other conductors in the near vicinity. Thus the addition or removal of a wire on a line, or the grounding of a circuit, may have an effect on the capacities of certain other wires. As a result of these conditions, it is very difficult to determine in advance of actual operation how much static interference will be caused by any particular power installation. It may be stated, however, that the presence of grounded telegraph circuits on a line will tend to reduce the static disturbances on the other wires. Static disturbances on wires of a line carrying many conductors will also be less than on wires which have only a few neighboring conductors. In the case of a heavy line, the static charges are probably distributed among the several conductors.

Comparison of Electro-Static and Electro-Magnetic Disturbances.—From a consideration of the foregoing discussion, it is possible to draw the following conclusions regarding the characteristics of electro-static and electro-magnetic induction, and their differences.

Electro-magnetic induction varies with the current and therefore with the load; electro-static induction is practically independent of the load

Electro-static induction is proportional to the voltage; electro-magnetic induction is unaffected by the voltage.

Both magnetic and static disturbances vary with the frequency and wave form.

Voltages induced by magnetic effects are proportional to the length of exposure; static "potentials" are independent of length.

Static "disturbances" are proportional to the length of exposure; magnetic effects vary practically with the length of the exposure, except when the impedance of the exposed section of a circuit is a large part of its total impedance. In the latter case, both the induced voltage and the line impedance will vary with the length, and the induced "current" will be largely independent of length of exposure.

Current from magnetic induction is practically the same in all parts of an exposed circuit; current from static induction is different in different parts.

Static disturbances are less when there are many wires on the disturbed line, and may be entirely prevented

by shielding with a grounded sheath; magnetic effects are practically unaffected by the near presence of other conductors.

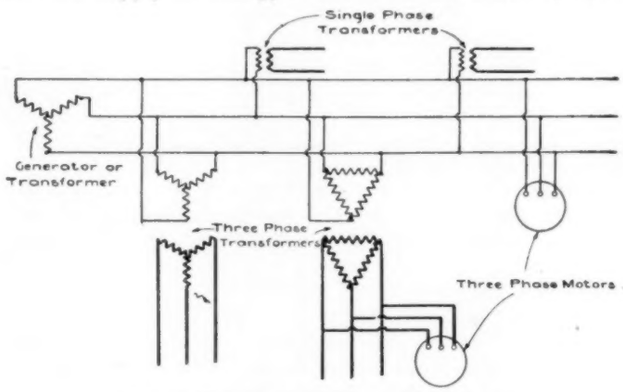
TELEPHONE AND TELEGRAPH SYSTEMS.

Most of you are very familiar with the principles of the telephone and telegraph, and with the systems that are in more or less universal use on the railroad lines of this country. Therefore it is unnecessary to describe the details of this branch of the subject. A general description of the usual systems will be given, however, so that any who may not be well acquainted with the telephone or telegraph operation may better understand the manner in which inductive disturbances take place and the methods by which they may sometimes be overcome.

Telephone Systems.—In country districts where the electric power and railway industries have not been established, and where the requirements of the service are not exacting, telephone circuits are sometimes operated with a single conductor and earth return. But these systems rarely exist in localities where induction is liable to be encountered, and therefore will not be further considered in this paper.

The standard telephone system comprises two wire metallic circuits with the telephone instruments bridged across the circuit. The two sides of a circuit have practically equal resistance, capacity and insulation, so that both wires will be equally subject to outside influences. Thus there will be no tendency for an outside or foreign current to flow from one side to the other and make the telephones noisy. To still further "balance" the circuits against outside effects and to prevent "crosstalk" or "over-hearing," the two wires of a circuit are usually transposed at regular intervals. That is, their pin positions on a pole line are interchanged.

There are two broad types of telephone systems, the magneto or local battery and the common battery. As its name implies, the local battery system has its current supplied at many points, each transmitting station having its own supply of energy. In the common battery sys-



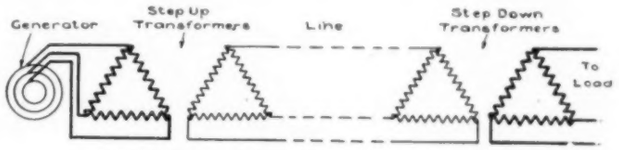
THREE PHASE DISTRIBUTION SYSTEM

Fig. 4.

tem, all energy is supplied from the central office. In either system, the current in the local circuits consists of a small, high frequency alternating current superimposed on a direct current. When used for "toll" or long distance work, the direct current is eliminated by repeating coils or condensers, and only alternating current flows in the line. For the purposes of this paper, therefore, the two systems are identical and need not be considered separately.

The frequency of telephone currents is variable, about 800 cycles per second being generally regarded as a fair average value. The human ear, however, is not very sensitive to low frequencies, such as form 25 up to 60 cycles. Therefore a comparatively large current of low frequency may exist in a telephone circuit without greatly influencing its efficiency. But if the frequency of a foreign current is anywhere near that of the telephone currents, this current may be very small and still be strong enough to cause serious disturbances.

During recent years, the phantom telephone circuit has been introduced into many telephone systems. A



THREE PHASE TRANSMISSION LINE

Fig. 5.

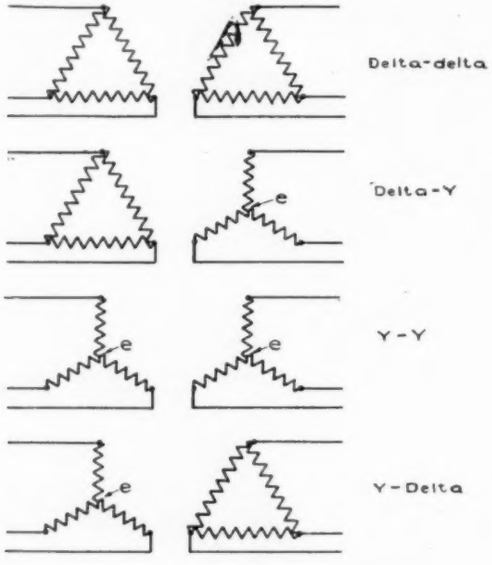
phantom circuit is a third telephone circuit obtained from two pairs of wires. It is essentially a four wire circuit, using two wires in parallel for each side. Each of two adjacent telephone circuits on a pole line is provided with a neutral point at each end, by means of a bridged retardation coil or a repeating coil having a tap in the middle of its line side. These two neutrals at each end of the circuits are then used as terminals for the phantom circuit and equipped with telephone apparatus in the usual manner. In order to obtain a quiet phantom and to prevent crosstalk, the two pairs of a phantom circuit must be frequently transposed or interchanged, just as any two wire circuits must be transposed. In considering induction, the problem presented by a phantom circuit is practically the same as that by any other telephone circuit, except it is a more difficult one. On account of there being four wires, separated quite a distance from each other, the possibility of unbalances and noises is much greater than on a two wire circuit. Therefore it is sometimes very difficult to obtain a quiet phantom telephone circuit when inductive influences are present.

Telegraph Systems.—Practically all telegraph systems use a single conductor with earth return. The usual circuits consist of relays and keys in series with the line and a battery at each end. Stations may be as many as consistent with satisfactory operation of the circuit and may be located at any point in the line. Signals are transmitted by interrupting the line current, which always flows in one direction.

Another type of circuit which is largely used is the duplex, by which two messages may be transmitted simultaneously, one in each direction. The duplex telegraph uses reversals of current, positive and negative impulses being alternately sent out on the line from either end. The duplex feature is obtained by providing a split in the circuit between the "transmitting" or "pole changing" relay and line. One branch of the split goes to the line and the other to an artificial line, which is adjusted so as to have practically the same constants as the real line. The receiving relay is connected in circuit with the real and artificial lines in such a way that it will not be affected by the outgoing currents, but will be operated by changes in line potential at the distant end. There are two general ways of connecting the receiving relays into circuit. One, known as the differential method, uses a polarized, differential relay, having one winding in the real line and one in the artificial line. The other, known

as the bridge system, uses an impedance in each leg, at the split in the circuit, and a polarized relay connected between the real and artificial lines, in a typical bridge arrangement.

Not all telegraph circuits are operated by hand sending. There are several types of high speed, automatic printing telegraphs, such as the Wheatstone system and the Barclay printer. Most of these systems are operated over a duplex circuit. They consist principally of an automatic transmitter, operated by a perforated tape or typewriter keyboard arrangement, and of a receiving device for recording the incoming signals, either as dots and



TRANSFORMER CONNECTIONS

Fig. 6.

dashes or in regular typewritten form. On account of the high speeds at which the automatic systems are operated, the various transmitting and receiving relays are much more delicate and sensitive than those used in manually operated systems.

The quadruplex telegraph, by which two messages may be sent in each direction, simultaneously, is a modification of the duplex. The quadruplex feature is obtained by varying the strength of the current and using a second receiving relay which operates on changes in current. This "neutral" relay, as it is called, is not affected by changes of polarity, but will operate whenever the current through it increases or decreases beyond a certain strength. The minimum current, however, must at all times be strong enough to operate the regular polar relay of the duplex circuit.

A telegraph circuit operates on a larger current than a telephone circuit and therefore will be less influenced by disturbances from induction. On the other hand, a telephone circuit contains two wires and can be balanced up so as to partly neutralize any induction which it may be subject to. But a telegraph circuit is grounded and cannot be transposed or otherwise balanced against induction. For this reason, the only methods of overcoming inductive disturbances on a telegraph circuit are to either remove the cause, neutralize the effect on the terminal apparatus, or to introduce other currents which will oppose and neutralize the disturbing currents.

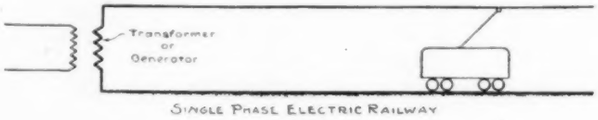
ALTERNATING CURRENT POWER SYSTEMS.

Constant Potential Distribution Systems, Single Phase.—The single phase circuit illustrated in Fig. 2, was the first alternating current system used for electric lighting and power, and is probably still more widely used than any other system. It is a two wire circuit, usually with a voltage of 1100, 2300, or some approximate multiple of these values. Small step-down transformers are bridged across the line to reduce the voltage to that used for lighting. Sometimes the low potential side of the transformers has three taps, as shown at "A." The outside wires are of twice the distrubuting voltage, and the load is connected between either outside wire and the middle or "neutral" wire. Another arrangement of the single phase system is to use three wires for the main transmission circuit, the potential between the middle and outside wires being half that between the outside wires. The step-down transformers are then connected between the middle and outside wires.

When the circuits are well insulated and balanced, the currents and voltages in the two sides of the circuit are equal and opposite. Under these conditions, inductive effects on other systems will usually be small. But distribution circuits are often in close proximity to trees and foliage, and grounds are not infrequent. These points of poor insulation upset the electro-static balance and greatly increase the inductive effects, especially on telephone lines. Disturbances of this character may often extend over an entire distribution system, by reason of an unbalance on one circuit causing a similar unbalance on all other circuits which are connected to the same power house bus-bars.

Series Arc Lighting Systems.—This is a local lighting system, consisting of a number of arc lamps, often from 50 to 75, in a series circuit. Typical circuits are shown in Fig. 3. The current is constant, usually about seven amperes, but the voltage varies with the number of lamps in circuit. Since the drop per lamp is about 80 volts, the potential across the circuit at the generator end may be as high as 6000 volts, and is often even higher.

Circuits of this character are necessarily very unsymmetrical. Even when the two sides of the circuit are close together, and the lamps are arranged as symmetrically as possible, very considerable inductive interference may be caused on nearby lines. Moreover, arc lighting circuits are much more subject to faults and grounds than the lighting and power circuits described above. This is partly because of their higher voltage and partly



SINGLE PHASE ELECTRIC RAILWAY

Fig. 7.

because the nature of arc lighting service offers many opportunities for the development of troubles. Telephone systems are the chief sufferers from arc light induction.

Three Phase Distribution and Transmission Systems.—Three phase circuits are usually used for distribution when the load consists largely of motors and power. Practically all transmission systems are also three phase. Fundamentally, three phase operation consists of three sources of alternating electromotive force of the same voltage and frequency, associated together

with one transmission system. The three voltage supplies are furnished by three separate windings on one generator, but differ in phase by one-third of a cycle. When connected to a three wire line, the effective voltages between any two wires and the effective currents in the separate wires are the same, assuming a balanced system. At any instant, however, the algebraic sum of the currents in the three wires or of the voltages between the wires is zero, on account of the phase difference of the wires.

A typical three phase distribution system is shown in Fig. 4. The line may be fed directly from a generator or from a transformer supplied by a high tension line. The load may consist of motors operating at the line voltage, of three phase transformers which step the voltage down for motors, lighting, etc., or of single phase transformers for lighting and other miscellaneous purposes. When single phase transformers are used, or single phase circuits are taken off the low tension side of the three-phase transformers, there is a great likelihood of the three-phase line becoming unbalanced. This unbalance is caused by unequal currents in the three line wires, and, as will be explained later, will usually result in increased induction in neighboring circuits.

Fig. 5 illustrates a three-phase high tension transmission line. Generators are built for voltages up to 11,000 or 13,000 volts, and even have been built up to 22,000 volts, but step-up transformers must be used for all higher voltages. The generators are usually star or "Y" connected. The step-up and step-down transformers, however, may be connected in a variety of ways. A few of the more common methods are shown in Fig. 6. Whenever "Y" connections are used, either in generators or transformers, there is established a neutral point, indicated at "e" in the diagrams. Unless a system is unbalanced, this neutral has equal potentials to each of the terminals or line wires. It is also at or near ground potential. In many power systems, the neutrals of generators or transformers are grounded, either directly or through a resistance. This condition, the grounding or non-grounding of neutrals, has a very considerable effect on the inductive disturbances in paralleling telephone or telegraph systems, and will be discussed later.

Since three-phase voltages and currents add up to zero, algebraically, there would be no induction in neighboring circuits if the transmission system was perfectly balanced and its wires very close together compared to their distance from the other lines. Practically, however, the high voltages used for transmission necessitate wide separation of the wires. Usually, also, the wires are at different heights and have somewhat different capacities to earth. Consequently a system is seldom exactly balanced and the induction caused by the different wires is only partially neutralized by the others.

Single Phase Electric Railways.—One of the more recent and probably the most troublesome addition to the family of "disturbers" is the single phase alternating current railway. This single phase system is practically a development of the last six or seven years, and is not used on a great many railways. Where it does exist, however, the maintenance of satisfactory telephone or telegraph service on nearby lines is a difficult, expensive, and sometimes impossible proposition.

A simple single phase railway circuit is shown in Fig. 7. One side of the power supply is connected to the trolley wire and the other side to ground and the track. Power may be supplied directly from generators, or as shown in the diagram, from transformers fed by a high voltage transmission line. Trolley voltages of 3,300, 6,600 and 11,000 are in use at the present time. Where a line goes through thickly populated districts, the trolley potential is sometimes stepped down to 600 or 700 volts.

Since the single phase systems use a track and ground return, there is no neutralization of inductive effects, and the disturbances on neighboring wires are much greater than would be caused by a metallic circuit. Where the trolley voltage is high, as mentioned above, much of the disturbance in paralleling systems may be of an electro-static nature. In most of the actual cases that have been encountered, however, disturbances from electro-magnetic induction have been the most serious.

Harmonics and Irregularities in Alternating Current Systems.—Most alternating current generators produce an irregular shaped voltage wave. That is, the voltage does not vary uniformly according to the sine law, but is distorted by waves of higher frequency, caused by variations in the driving torque or speed, or by variations in the armature reactions. Similarly, the voltage wave from transformers is usually distorted, due to variable permeability and hysteresis losses in the transformer core. The distorting waves are odd harmonics, those of three and five times the fundamental frequency usually predominating. Higher harmonics are also quite common. Some of these harmonics are nearly always present in alternating currents and voltages and may be as large as 50 per cent of the fundamental wave.

The presence of harmonics in a power circuit is often the principal cause of induction in neighboring systems. In the first place, the harmonics often cause high peaks in the voltage wave, which result in correspondingly higher static effects on other lines. And secondly, since both magnetic and static disturbances increase with the frequency, the higher harmonics of a disturbing circuit will always be more or less prominent in the induced currents and may be the only currents causing serious effects. Another reason why harmonics, especially the higher ones, are most liable to cause disturbances on "telephone" circuits is that they are nearer the frequencies to which the human ear is most susceptible. Harmonics are not so liable to cause disturbances on "telegraph" lines, for the reason that most of the telegraph apparatus now in use has too much mechanical inertia to respond to the high frequency currents. This last statement does not strictly apply to circuits and apparatus used for high speed automatic telegraphy.

Harmonics in a three-phase system are especially important when considering inductive disturbances on paralleling systems. The three currents in a three-phase circuit are one-third of a cycle apart. The third harmonics, which have a frequency of three times the fundamental, are three times one-third of a cycle apart, or in phase with each other. In a balanced three-phase system, the voltages between the lines must add up algebraically to zero. Therefore, third harmonics, and their multiples, cannot exist in the "voltages" between the line wires. They can, however, exist in the voltage between arch line, and the neutral or ground. Also in the delta current from line to line at the generator or transformer, and in the line currents when there is a neutral ground or ground return to the generator or transformer neutral. In a star or "Y" connected system, the three line wires act together as a single phase circuit, with a potential to ground equal to the voltage of the third harmonic and its multiples. This condition is a frequent cause of

static disturbances, which are sometimes still further increased by grounding the neutral at the generating end of the circuit. When neutrals are grounded at both ends, the triple frequency voltage from lines to ground is changed to a triple frequency single phase current over the line wires to ground. These triple frequency currents can cause electro-magnetic disturbances in paralleling systems.

(To be continued.)

Telephone Adds to Backwoods Life

Perhaps there are but few, if any, states in the Union that have in use more telephones in the rural districts, in proportion to population, than has Virginia. Especially in the counties within a circle of fifty miles around Richmond, the telephone is exceedingly popular. Perhaps the county of Chesterfield has more telephones than any county in the state, and it is certain that no county in this or any other state has a better service. Of course, the rural service is not, and in the nature of the case cannot be, altogether as satisfactory as the city service, but considering all of the drawbacks that are natural on lines that must be strung along country roads and must have many subscribers swung on to one wire, the rural service in the counties near to Richmond is good, and, with all of its faults, as compared with the individual line service enjoyed by city people, the country folks who have had the wires run into their homes would not be without it for several times the amount of money they have to pay for it. As a matter of fact, the country telephone is really more of a necessity, if possible, than the city telephone, and the country people are no longer looking upon it as a luxury or a plaything.

With telephones through which country people can talk to all their neighbors and to their city cousins and friends in and out of business; with good roads, with good schools and good churches; with modern machinery to farm with, and with very nearly as many household and kitchen conveniences and comforts as city people enjoy, life in the backwoods of Old Virginia is beginning to be true life, and really worth living.

The Importance of Telephone Manners

In an article on "Telephone Courtesy," in the March *Woman's Home Companion*, the author says in part:

No well-bred man or woman should drop into a man's parlor before he starts for business in the morning and engage him in a long winded discussion. Yet I have known women interested in charities or civic movements to call up a business man at his home by telephone during the breakfast hour and start the conversation by stating that they had chosen the hour knowing that he would surely be 'at leisure.' They have ignored the crispness if not the bluntness of his replies, and continued to talk, while his breakfast cooled or his affairs at the office demanded his presence. And finally they have wondered why their mission failed!

Would any woman making any pretense to good breeding enter your home at dinner time and engage you in conversation, knowing that your dinner and family awaited you in the dining room? Yet how often have you been greeted at the telephone with this remark:

"Oh, were you at dinner? Then I won't keep you a minute."

But the minute runs into five or ten, the talker holding you grimly to the topic nearest her heart, while your dinner turns cold.

Is it any wonder that business men protect themselves by sending clerks to answer the telephone? or that in many household servants ask who is calling and what is wanted before summoning members of the family? How else can one protect himself from telephone bores and the abuse of telephone courtesy?

Katy a Big Telephone User

The Missouri, Kansas and Texas Railroad has just completed into Houston a telephone system for dispatching trains, to take the place of telegraphy for that purpose and the change has proven most satisfactory to officials of the operating department.

While dispatching trains by telephone is not altogether new, it has been installed by only a few roads throughout the United States, some only in part and with others more generally. The Santa Fe has been using telephones for dispatching trains on a good part of the Gulf lines for nearly two years and is putting them in more general use, as the system is brought up to a higher degree of perfection.

At present neither the Katy nor Santa Fe are using the telephones for service messages, these being still handled by telegraph, but it is thought that it is only a question of time when both these roads will do away with telegraph instruments altogether. The installation of telephone facilities to handle all wire business for a railroad is said by local officials to be very expensive as to the first cost, after which it is less expensive than telegraphy, besides much more practical and effective for all purposes.

When the system is completed it will not only be used for dispatching trains and for service messages between stations and terminal points, but freight, passenger and work trains as well as section gangs will be supplied with portable telephone sets. By means of an extension pole a connection can be made at any time with the telephone wires along the right of way, affording prompt communication with division headquarters or any station along the line.

Officials in Houston who are familiar with the use of the telephone in this way say that the saving of time is something enormous, in handling trains as well as being a very important factor in the safety move that is now receiving so much attention by railroad officials throughout the country.

In case of an engine failure or derailment or other similar accidents to passenger trains, the train crew can connect their telephone and in a few minutes summon another engine to take the train and dead or disabled engine, or, if necessary, send a relief train to which the passengers may be transferred and permitted to proceed.

The dispatcher not only sends prompt relief, but with a few brief orders is able to direct the movement of other trains, and where necessary detour without further delay. With the telegraphic service it is necessary for another train to come along and learn of the trouble, which, if the latter is a passenger train, and detouring is necessary, it must back up to the connecting junction point, to make connection with another line. This often consumes as much time as it would have taken to detour, if the trouble had been known prior to passing such junction point.

It is also pointed out that the telephone not only provides communication during the hours when operative officials are on duty, but by arrangement with commercial telephone systems along the line the railroad circuit can be linked to the commercial line and prompt communication had directly with any official of the road either at home or in the office and the proper official consulted.

Both Santa Fe and Katy officials attach a great amount of importance to the new system, to the extent that they now have it in operation.

Protecting Telephone and Telegraph Lines

By M. H. Clapp*

THE most reliable form of open space cut-outs so far developed for telegraph and telephone service, consists essentially of two conducting plates or blocks separated by an accurately regulated air gap. The thickness of the air gap and the material of which the conducting blocks are composed, determine the voltage on which the cut-out will operate. To maintain the proper thickness of the air gap mica separators are used to a large extent, the thickness of these separators being kept within close limits by careful manufacture and inspection. For low voltage cut-outs, about 1,000 volts or less, carbon is quite generally used for the blocks. For higher voltages various metals are available. With properly designed plates or blocks and mounting, the arresters of this type fulfill two most important requirements that can be specified for such devices, namely:

(a) They operate promptly at the proper voltage.

(b) They carry safely heavy currents if the operating voltage remains on the circuit.

In addition, well designed arresters of this form have the property of clearing themselves after discharges of small or moderate intensity. After heavy discharges, however, it is necessary to clean or replace the arrester parts.

In general, the high capacity fuse should have an amperage of about 10 amperes. The open space cut-out should operate at a voltage as low as possible, consistent with non-interference with the operation of the apparatus protected, for if the voltage necessary to operate the cut-out is too high, the apparatus is more likely to burn out, or if too low, there will, of course, be interference to the operation of a high voltage current, as a telegraph current on the circuit. Under present conditions, it would seem that it would be necessary to have the operating voltage of the open space cut-out at least 500 volts, and possibly 750 volts for use at the line end of cable conductors. The low capacity fuse or heat coil should always be placed between the open space cut-out and the apparatus to be protected and the carrying capacity should be from .2 to .8 ampere, depending on the conditions. If choke coils are placed in the line, they should be placed between the open space cut-outs and the low amperage fuses. The function of these coils is simply to choke back any lightning discharges that might go by the open space cut-outs, thereby helping the open space cut-outs to perform their function. Also, in some cases, it is apparently necessary to use two sizes of low amperage fuses, one for very delicate apparatus; another for apparatus less delicate. The necessity for this form of protection is best illustrated by the experiences of the A. T. & T. Company briefly outlined above.

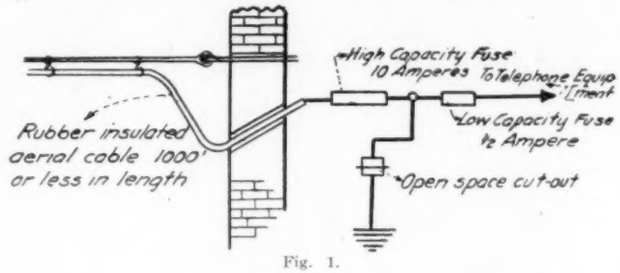


Fig. 1.

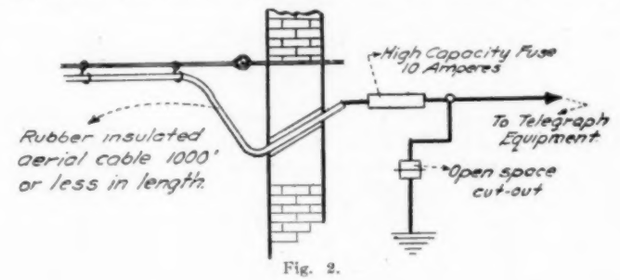


Fig. 2.

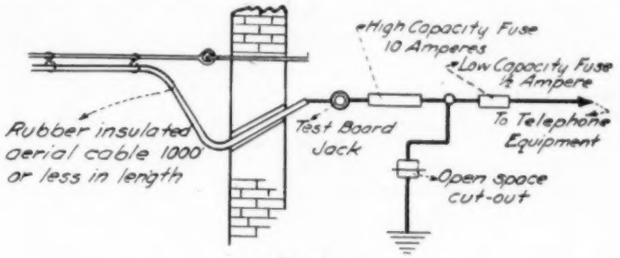


Fig. 3.

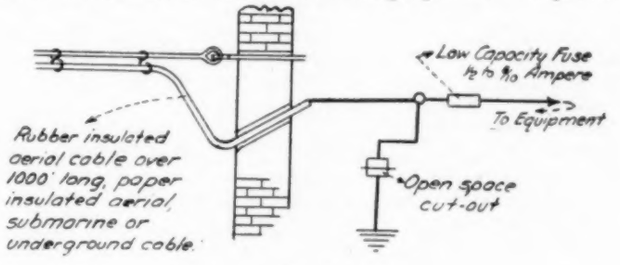


Fig. 4.

APPLICATION OF THEORY OF PROTECTION.

I now desire to indicate the application of the above described theory to various combinations and arrangements of telegraph and telephone apparatus and cable. In the first place, I desire to emphasize the fact that in railway work it is absolutely essential to use a form of protection that will operate a minimum amount of times when subjected to lightning or crosses with power circuits, and still give a reasonable amount of protection. In other words, on account of the large number of small and inaccessible offices and points that most railroads have in connection with their telegraph and telephone plant, they cannot afford to have any protective apparatus that it is continually necessary to restore to its normal condition, even though it is operating as intended and really protecting the line and apparatus. It would be, on the whole, better to run some chance and burn out some apparatus in preference to having too delicate protection.

Telephone apparatus, consisting of fine windings on

* Paper read at the annual meeting of the Association of Railway Telegraph Superintendents. Concluded from June.

coils, resistances and electro magnets or delicate relay points, requires, as has already been indicated, the greatest amount of protection of any equipment, appliances or wiring at present used in our work. I believe that 10 ampere fuses, used in connection with open space cut-outs operating at about 500 volts, along with low capacity fuses of ½ ampere, would give the best results, the open space cut-outs, of course, to be thoroughly grounded. Fig. 1 shows arrangement of open space cut-out and fuses as outlined above.

I also believe that it is good practice to place retardation coils on both sides of the line in series with various magnet windings bridged on the line, where there will be no interference with the telephone transmission. I also desire to make the point that it would be a good proposition to put in more sensitive fuses and protection at points where there are attendants to replace them in case they operate as designed. It is also apparently a good proposition in connection with dispatchers' circuits to place open space cut-outs designed for this service outside and in the immediate vicinity of dispatchers' offices.

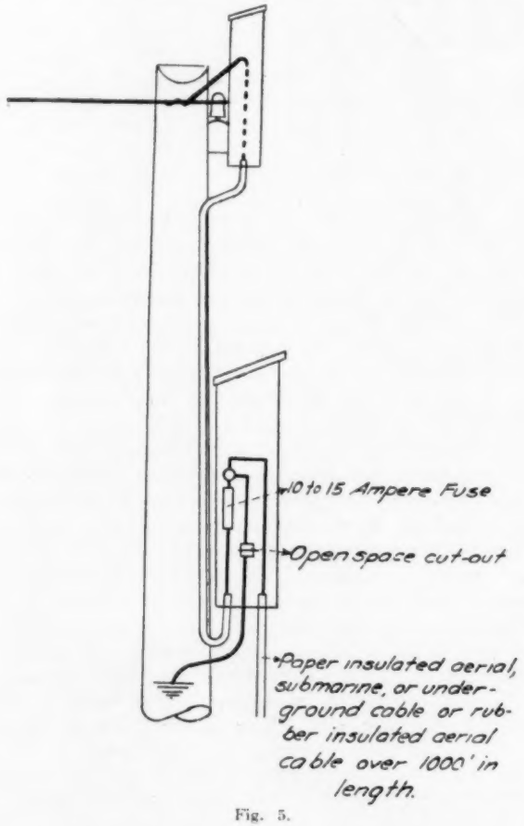

10 to 15 Ampere Fuse
Open space cut-out
Paper insulated aerial, submarine, or underground cable or rubber insulated aerial cable over 1000' in length.

Fig. 5.

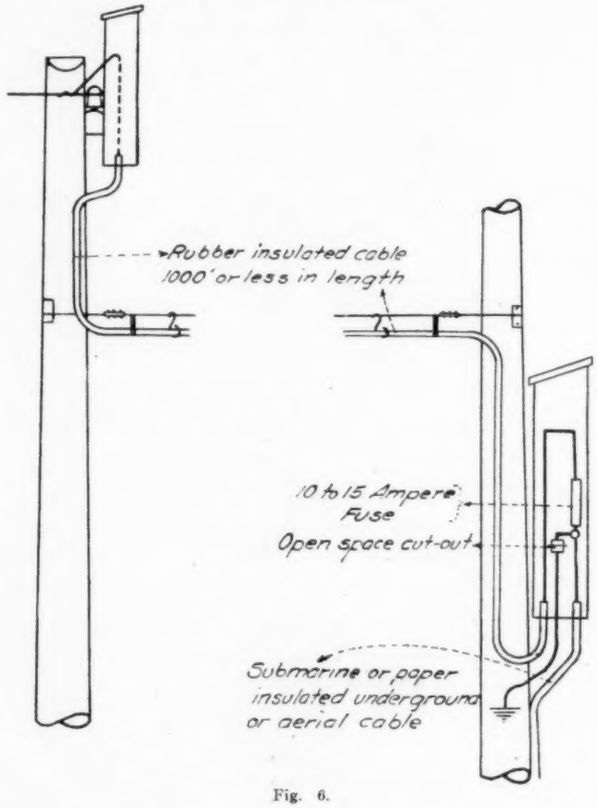

Rubber insulated cable 1000' or less in length
10 to 15 Ampere Fuse
Open space cut-out
Submarine or paper insulated underground or aerial cable

Fig. 6.

Seven to 10 ampere fuses with open space cut-outs designed to operate at 500 volts, would appear to be sufficient to protect line relays at way stations. Fig. 2 shows the arrangements of fuse and cut-outs as outlined above. At repeater stations it would appear necessary, in order to protect the delicate windings of repeater, quadruplex and duplex apparatus, to use some form of delicate heat coil, as a coil of fine covered wire, wound around a grounded cylinder.

Test panels, switchboards and patching boards, if designed and installed properly, so as to stand a breakdown test of at least 1,000 volts, do not require, I believe, any protection. At least, it would only be necessary to use some form of open space cut-out. Any apparatus installed in an office without protection, should be placed in fire-proof cases or on fire-proof mountings, and heavy insulated cable used between the apparatus and the line wires. These installations, however, would, in general, be restricted to small test offices along the line. Any terminal office or test office of considerable size, especially if there are capable attendants available during the greater portion of the day, should be provided with high capacity fuses and open space cut-outs in connection with all wires entering the office. With this arrangement of no protection, in connection with the test panels or patching boards in test offices, it would still be necessary to protect the apparatus in the office as outlined under 1 and 2, which would be installed between the test panels or the patching boards and the apparatus. Fig. 3 shows the arrangement of test board jack, fuses and open space cut-out outlined above. At a bridging office, it would probably be better to place the fuses of high carrying capacity and the open space cut-outs on the line side of the test panel, peg switch or patching board, as nothing would be gained in placing them on the apparatus side.

RUBBER INSULATED CABLE.

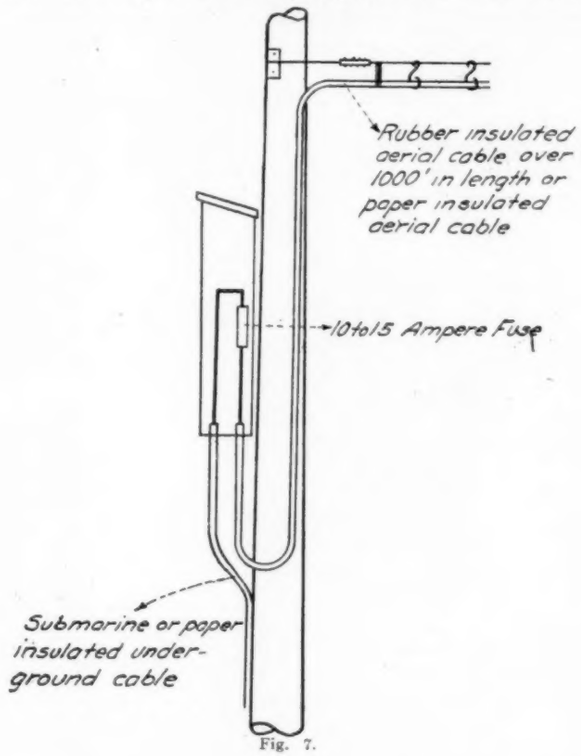
Aerial rubber insulated cable, where the length is 1,000 feet or less, would, under ordinary conditions, not need any protection at the end connecting with the line wires, all the protection being installed at the office or opposite end of the cable. See Fig. 6.

Where rubber insulated cable is installed aerially and the length is over 1,000 feet, high capacity fuses

with open space cut-outs should be installed at the end to which the line wires are connected. See Fig. 5. The capacity of the fuses used would, in general, be greater than the capacity of the fuses used inside of offices, possibly 15 amperes. The open space cut-outs installed should also operate at a higher voltage than necessary to operate the open space cut-outs that may be installed at the office end of the cable. When rubber insulated cable is installed in conduits underground, it can, I believe, be safely connected to aerial wires without protection at the outer end up to possibly 300 feet in length.

UNDERGROUND CABLE.

Paper insulated cable installed either aerially or underground, should be protected at the line end by the use of open space cut-outs and high carrying capacity fuses. See Fig. 5. The amperage of these fuses should


Rubber insulated aerial cable over 1000' in length or paper insulated aerial cable
10 to 15 Ampere Fuse
Submarine or paper insulated underground cable
Fig. 7.

be higher than that used in offices, as, for example, 15 amperes, the open space cut-outs also should be designed to operate with a higher voltage than that used in offices. At the office end of paper insulated cable, either underground or aerial, open space cut-outs and fuses of low carrying capacity should be installed. See Fig. 4. Where underground and areal cables are connected together, fuses having the same carrying capacity as the fuses installed at the line end of the areal cable, should, in general, be placed at the point of connection of the two cables. See Fig. 7.

SUBMARINE CABLES.

Submarine cables should be protected with high capacity fuses and open space cut-outs placed at each end. See Fig. 5.

In conclusion, I desire to say that I believe that it is most vital and essential that whatever kind, type or arrangement of protectors is used, they should be the best that can be obtained. From my experience, there is no way of losing efficiency faster than by using cheap protective apparatus. All parts of the protectors should be of substantial make and especially designed with view of keeping the essential operating parts of the protectors in proper position so that they can operate as designed. By using this class of apparatus and following the principles and theories outlined above, I believe that adequate protection for telegraph and telephone apparatus can be obtained.

he Cumberland's Welfare Work

In the movement to better the conditions of the working girl, the Cumberland Telephone and Telegraph Company is playing an active part. To promote contentment, add moderate comforts and pleasure, relieve the monotony of routine work and increase the operative efficiency of the force, steps have been taken during the past few weeks which are proving a decided success.

The entire third floor of the telephone building at Seventh and Cherry streets, Chattanooga, Tenn., has been transformed into a rest or club room for the girls. It is commodious, well furnished and equipped with modern dining room and accommodations. A hospital room fitted with emergency apparatus and all modern conveniences adjoins the club room.

The service of the dining room is the most remarkable feature of the new arrangement. A noonday meal has been arranged with the view of eliminating the cold lunch habit. In order that this arrangement may be sufficiently attractive and within the reach of every employe, a club luncheon is served for 5 cents which is composed of five dishes, served as well as any cafe in the city could do it. To illustrate: One Tuesday's noon menu consisted of the following dishes: Beef roast, sliced tomatoes, rice with gravy, creamed potatoes, bread and coffee or iced tea. Special attention is paid to the hygienic quality and the food is well cooked and palatable and presents a tempting appearance. Special orders, such as ice cream, sandwiches, fruit and other dainties, are afforded at nominal prices.

Aside from the eating accommodations and rest rooms, other conveniences and pleasures are enjoyed. A phonograph has been purchased and supplied with good records, and a place is provided in the center of the main hall where the girls dance to the phonograph music during the rest hours. This diversion rests and refreshes the girls, so that the work in the operating room is carried on to better advantage. A moderate sized library has also been purchased and the books and cases are now on the way here. Interesting literature by good authors compose the selections. The books will be allowed to circulate, the girls taking them to their homes. This plan is expected to serve the double purpose of rest and amusement and to teach an appreciation of good authors which many who will take advantage of the opportunity would otherwise never acquire.

Knoxville will soon follow the lead set by Chattanooga. The improvements will be inaugurated there next fall.

A bill has been introduced by the Dutch government for the establishment of telephonic communication between Holland and Great Britain. The length of the proposed cable will be 165 km., and the cost, which is estimated at £62,000, will be equally shared by the British and Dutch post offices. It is proposed to run the cable from Westkapelle (island of Walcheren) to Orford Ness (Suffolk), and it will be laid before September, 1913.

Multiplex Telegraphy and Telephony

By W. R. Birt*

DURING these times when so much is being said about economy, efficiency and conservation of various forms of energy, it might not be amiss to consider some of the ways that savings may be effected in the telegraph department of a railroad.

Railroads generally have long lines of copper multiplex telegraph circuits extending from their general offices to their many divisional headquarters. These circuits are used exclusively for the movement of long haul commercial and executive business of the railroad company. The message load they are expected to protect rarely exceeds the capacity of a polar duplex circuit. On a railroad having 6,000 miles of operated road, this class of circuits is frequently in excess of 3,000 miles. The cost of line construction of such circuits, based on the cost of wire, insulators, pins, tie-wires, sleeves and labor, is $38.79 per mile. Assuming a 50-year life, a net scrap value of $21.30 per mile, maintenance $1.00 per mile, taxes at one per cent, interest at 6 per cent, and $2.00 per mile for taking down, would cause an annual charge of $4.06 per mile to be assessed against these circuits. The utilization of this existing plant when equipping divisions with telephonic train dispatching and message circuits will make possible a saving of from $116,000 to $135,000.

The telephone train dispatching circuit as usually constructed is composed of No. 9 B. & S. gauge hard drawn copper wire. The average length of a train dispatching circuit is 130 miles. In the valley and desert districts the separation between telegraph offices is between 12 and 15 miles; while in the mountain districts, the separation is generally between 5 and 6 miles. The requirements, therefore, are that this circuit shall have a transmissional margin sufficient to admit of from 10 to 22 way-stations simultaneously listening in on the line.

The selective calling equipment now generally employed on these circuits is of the electro-mechanical step-by-step type of selective relay, the essential features of which are a combination wheel and a time wheel, suitably governed by magnet, levers and detents. Just as a combination lock will open only to its own setting, so the selector can be operated only by impulses of a predetermined number and sequence. The combination wheel differs in its teeth cutting in every selector on a circuit, and while the calling impulse sent over the wire actuates every selector, yet it will not go to the contact position and operate to call an office unless its individual combination is made. The selector is wound to 4,500 ohms and is connected with the proper taper resistance so as to produce equal current in all bridges.

Automatic calling is accomplished by the use of keys in the dispatcher's cabinet, that have a simple train of gears operating a circuit breaker. The calling may also be done by Morse key sending over the line a predetermined number of impulses of current, properly spaced between each group of impulses.

The receiver circuit on the best type of railway telephone equipment developed for this class of service has an impedance of 2,500 ohms, therefore each receiver that is off of its hook occasions a transmission loss of approximately one cable mile for offices beyond that are receiving from the dispatcher.

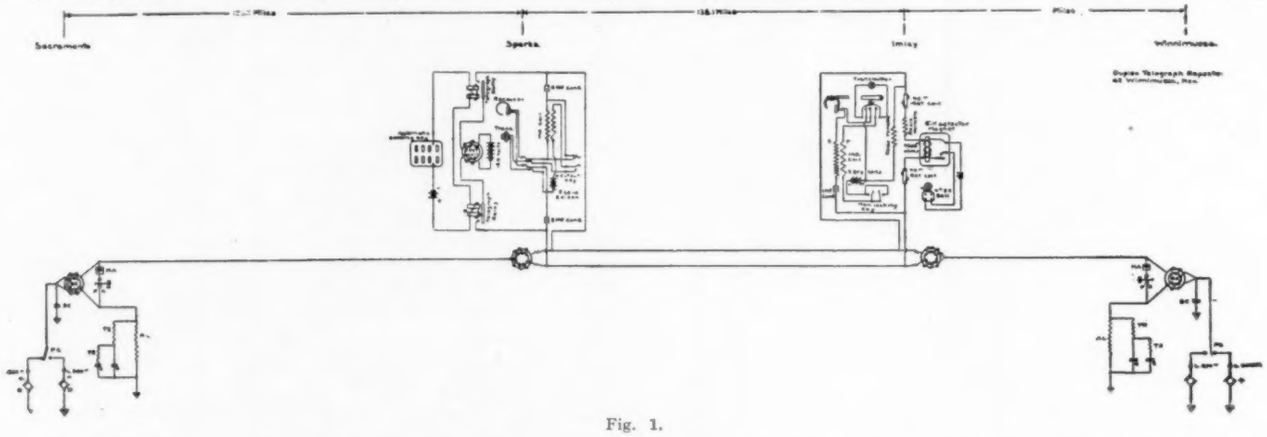


Fig. 1.

In Fig. 1 is shown a typical telephone train dispatching circuit which is in operation over the fourth district of the main line of the Southern Pacific Company's Salt Lake Division, between Sparks, Nevada, and Imlay, Nevada, a distance of 138.1 miles, and over which an Overland multiplex telegraph circuit is being regularly superimposed. The impedance bridges caring for the telegraph circuit at each terminal of the dispatching circuit have an impedance of 29,800 ohms to a frequency of 1,000 p.p.s., so therefore occasion a telephonic transmission loss to the dispatching circuit of less than one-tenth of a cable mile each. As the transmission over 30 miles of standard cable is regarded as the commercial limit, it is customary to express the transmision equivalent of any other kind of line as that length which gives the same volume of sound as 30 miles of standard cable. The attenuation of this cable at 800 p.p.s. is 0.103, and that for No. 9 B. & S. gauge hard drawn copper wire is .00652, therefore the length to which speech is commercial over this type of circuit becomes

$$L = \frac{0.103 \times 30}{.00652} = 474 \text{ miles.}$$

* Paper presented before San Francisco Section, A. I. E. E.

As this dispatching circuit is but 138.1 miles in length the line transmission loss at 15.8 miles of wire to one mile of cable, is 8.7 miles of cable, and that occasioned by the telegraph impedance bridges is .2 of a cable mile, there remains an equivalent in transmission of 21.1 cable miles for the way station equipment. There are 31 way station telephone instruments on this line, 12 of which are located at telegraph offices, the balance are in booths at the non-telegraph passing tracks, the possibility, therefore, of more than 21 of these way stations having the receiver simultaneously across the line is quite remote.

The first distinct advantage of the telephone, and one that is noticeable as soon as a circuit is placed in service, is the time saved in calling offices for the purpose of putting out orders. An operator having outside duties, such as delivery of freight, baggage or express, etc., has his attention immediately called to the fact that he is wanted by the ringing of the bell, while by telegraph he is called until he happens to come within earshot of the telegraph instrument; in the meantime, even though only five minutes may have elapsed, this may have made the combination the dispatcher had in mind valueless, and the set back this train received may result in its having a number of bad delays before reaching its terminal. In telegraphic train dispatching, the dispatcher copies the order in his book as it is first repeated; while in telephone dispatching, the order is written in his book as it is transmitted to the interested stations, thus making possible its repetition at about the rate of ordinary conversation, or in approximately one-fourth the time required to repeat it by telegraph.

The train movement which is being protected by the telephone dispatching circuit on the fourth district is perhaps the heaviest on the Salt Lake division. In addition to having all of the overland passenger and freight trains for a distance of 138.1 miles, the Tonopah trains, the Fallon branch, the Wadsworth branch and the Fernley-Lassen branch trains are all handled over this district for a distance of about forty miles; besides this the double tracking operations on the east end of the district require that innumerable work train movements against opposing trains be arranged for. The chief dispatcher remarked that between October 5 and November 1 the traffic became so great on this district that had it not been for the telephone dispatching circuit the district would have had to have been divided and an additional set of dispatchers put on to properly handle the traffic. The consensus of opinion, however, is that a telephone dispatching circuit increases the efficiency of the train dispatcher about 25 per cent. Although this train dispatching circuit is on a telegraph lead carrying 17 other telegraph circuits, the interruptions have been very few. Since the circuit was placed in service on September 4, 1912, there have been but four instances where the telegraph had to be resorted to to protect the train movement, and then only for a very few hours. Three interruptions were due to other wires breaking and fouling the dispatching pair, and the fourth was caused by a mica burning through and grounding the circuit in the lightning arrester at a non-telegraphic office.

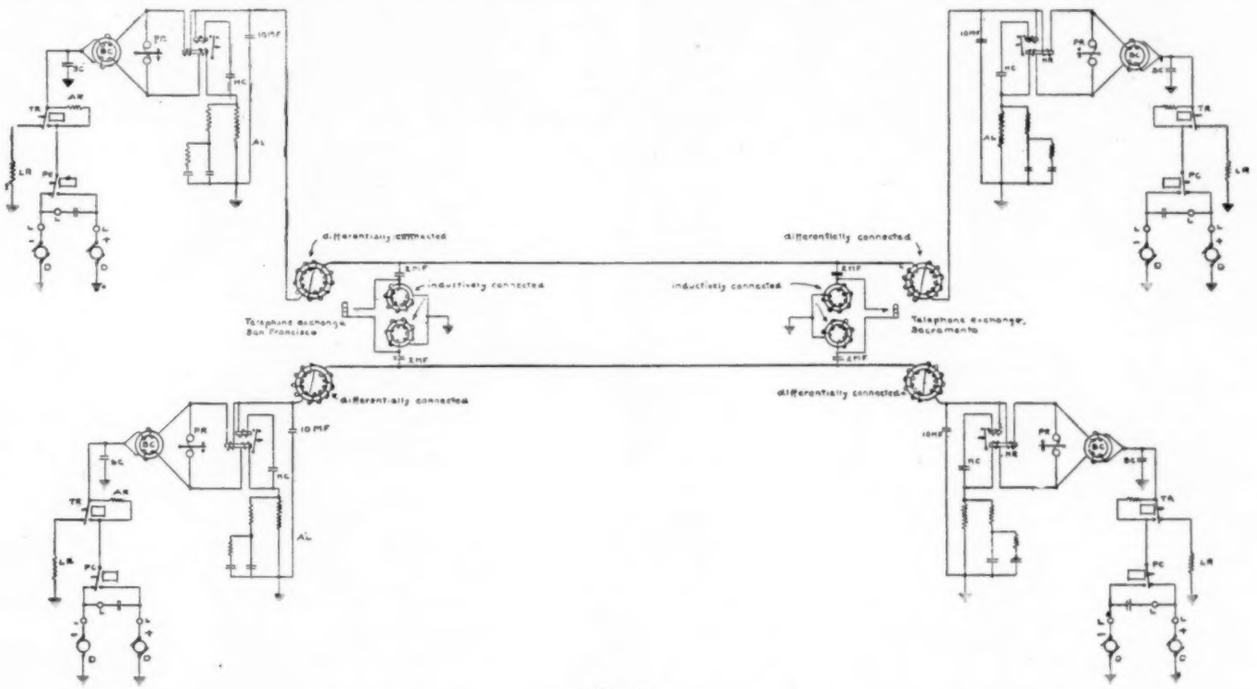


Fig. 2.

The telegraph circuit over this dispatching circuit is carrying between 350 and 500 messages during the office hour period daily, and apparently is as capable of speedy operation with semi-automatic transmitting keys as are those circuits containing no artificial inductance. The transmitting key referred to is used perhaps by four-fifths of the operators of this country. It consists of a vibrating rod or pendulum which when moved to one side by the operator makes a dash, and when moved to the other side automatically vibrates—until stopped by the operator—in the act of so doing making any desired number of dots. It is estimated that sixty per cent more movements are required in sending by the ordinary Morse key than by this device.

The repeating of this circuit at Sacramento has

not imposed any noticeable burden upon the repeater attendant at that point, for he is still able to handle nearly 300 messages and perform all of the repeater attendance required during his nine hours of service.

The impedance bridges now in use for the telegraph circuit have a d.c. resistance of 1,500 ohms, and it is found that this value does not give the dispatcher a "bat" in the ear when selectively calling a station. On a dispatching circuit 150 miles in length, such bridges together with the joint resistance of the paralleled wires make possible a telegraphic conductor having an ohmic resistance of 1,063½ ohms; the operation of two such dispatching circuits in tandem in bridge duplex telegraph service would require a potential of but 156.6 volts to maintain a line current of .050 amperes. With the multiplex sets poled in conjunction this voltage will develop a working current of 100 milliamperes in the main line, which is the amount used in practice. The increased leakage conductance due to the paralleled wires, however, suggests the use of the third potential (240 volts) on such circuits. The voltages that are standard in telegraph work and which are generally obtainable at the division terminals of a railroad are 160, 240 and 350; the last named potential frequently has a value of 320 volts. The coil lag due to the impedance bridges may be compensated for by placing an equivalent inductance in the artificial line of the multiplex apparatus. In the case of but one telephone dispatching circuit in the telegraph circuit it has not been found necessary to so compensate the artificial line of the multiplex equipment.

Telegraph departments have within themselves other opportunities for economic gains, because, fundamentally, two simple telegraph circuits are wasting one telephonic possibility. Therefore, the primary reason for repeating at Sacramento the circuit shown in Fig. 1, was in order that its telephonic possibilities between Sacramento and San Francisco might be taken advantage of. In Fig. 2 it is shown as the companion wire to the San Francisco-Portland multiplex circuit in a composite telephone circuit between the p.b.x's. at Sacramento and San Francisco. To make this talking circuit commercially quiet through the numerous serial telegraph cables in the city of San Francisco, the submarines and undergrounds, core strands in even conductor cables were assigned for its reception. With a view to silencing the effect of the Morse signals on the telephone receiver, a differentially connected coil is placed in series with each limb of the talking circuit and the telegraph side connected to the ground through a 6 to 10 microfarad condenser. A pair of conductively connected coils with the middle point grounded are bridged across the talking circuit for the purpose of removing the cross-fire between the telegraph circuits and lessening the noise on the talking circuit.

The bridge type multiplex apparatus is very efficiently operated over circuits of the composite type; one of the greatest advantages claimed for it being in the arrangement of the bridge coils. Instead of being ordinary non-inductive resistances as in the old type of bridge multiplex apparatus, there are two 500 ohm coils wound upon a ring shaped core of soft iron wires. The theory of which is that because of its closed magnetic circuit, this coil offers great impedance to any current passing through it from one end terminal to the other; consequently, a current coming in over the main line wire at first meets with considerable opposition in its attempt to flow through the bridge coil, and as a result almost all incoming current rushes into the polar relay. This effect lasts only for a small fraction of a second, during which time the opposition to the current in the bridge coil gradually disappears, thus allowing the currents in the various branches to reach their steady values. The brief initial rush of current through the polar relay is sufficient to pull the armature of that instrument over with a speed and precision out of all proportion to the smaller steady current passing through the relay during the remainder of the signal. It is in connection with the operation of the holding coil, which holds the neutral relay closed during the interval of no magnetism due to the current reversals of the distant pole changer, that this coil is particularly beneficial in quadruplex working, because its magnetic discharge is not only utilized to energize the holding coil, but owing to the gradual manner in which the closed core parts with its magnetism, the discharging current is lengthened out, and it is thus possible for it to act upon the neutral relay armature for a period more nearly equal to that represented by the interval of no current at the distant pole changer. Rapidity of action in the pole changer is made possible by its having two electro-magnets, one on each side of the armature, and both connected in series in the local circuit. The cores of the front magnet are laminated, which make that magnet quick-acting, while solid cores, surrounded by copper

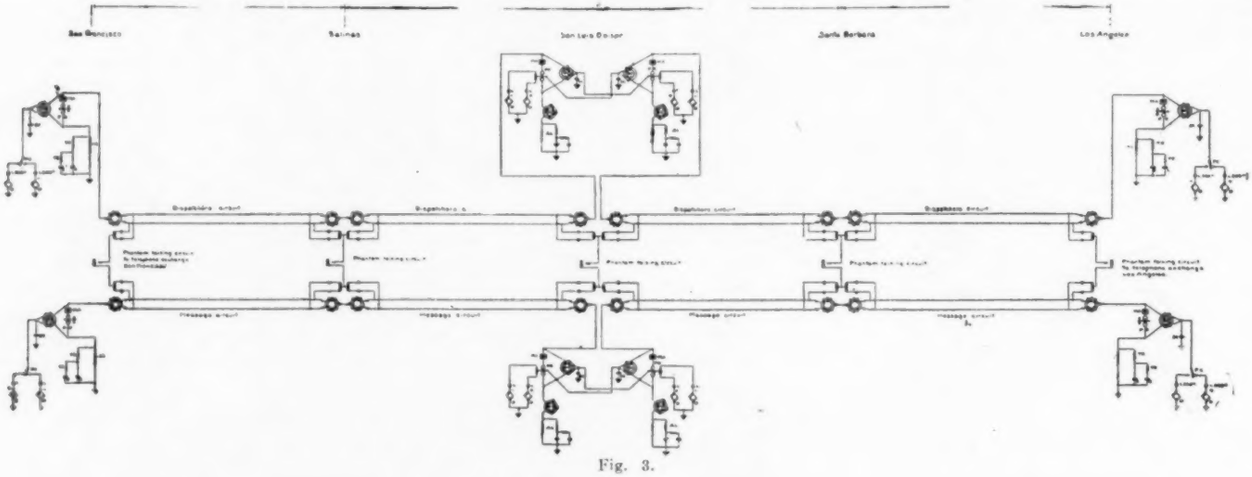


Fig. 3.

sleeves, are used in the rear magnet to make it slow acting. A light retractible spring is attached to the armature to hold it on the back contact and prevent shivering when the local circuit is open. When the local circuit is closed, current flows through both of the magnets of the pole changer, but the front magnet exerts its attraction slightly in advance of the rear magnet and thus pulls up the armature to the front contact. Soon afterwards, the rear magnet becomes fully energized, but cannot pull back the armature because the latter is now much closer to the front magnet. When the local circuit is open, the magnetism in the front magnet falls away very rapidly, while that in the rear magnet dies away gradually; as a result the front magnet releases the armature while the rear magnet is still capable of pulling it back and the armature is thrown over to its back contact much more swiftly than if the retractile spring alone was depended upon for this action.

The arrangement of the apparatus heretofore used for repeating from one multiplex set to another was that whereby the receiving relay controlled the sending transmitter through local connections, but the mechanical inertia of these instruments and the increased number of local contact points through which the operation is controlled was not conducive to high efficiency. In the center of Fig 3 is shown two pair of direct-point duplex repeaters; it will be seen that the arriving signal from the east or south will actuate the right hand polar relay thus placing the armature of that instrument in contact with a 240-volt negative potential, which is given an outlet through the center of the bridge coil to the line west, and in a like manner signals arriving from the west are relayed to the east by a reverse operation. As the local contact points of the polar relays are now employed to deliver line currents, special devices are provided to control the local circuits for operating reading sounders. When the direct-point repeater was first introduced the polar relays were equipped with double armatures, mechanically jointed together, but electrically separated, one contact controlling the line potentials, and the other the local circuit. The later day practice is to use the leak arrangement whereby a single tap is taken off of the armature of each polar relay and led to the ground through an adjustable 15,000 or 20,000 ohm rheostat. Another method of accomplishing the same result is to substitute a 0.5 mf. condenser for the leak coil, thus obtaining the same response in the polar relay without any loss of current through the leak coil to the ground. The facility of operation, therefore, of the present type of multiplex repeaters contributes in no small measure towards removing the limitations formerly placed on the permissible number of multiplex repeaters in a circuit.

Upon the completion of a dispatching circuit over a busy division, there is usually a demand for a like message circuit. When a division has both a dispatching and message circuit in service, it is obvious that the wires may be used not only for local station-to-station dispatching and message purposes, but for two through multiplex telegraph circuits and a phantom talking circuit as well.

Within 60 days, 63 per cent of the main line of the coast division will have been completely equipped for telephone train dispatching service. Upon its final completion, it is expected that the circuits will be arranged as shown in Fig 3. The phantom talking circuit thus obtained being carried to the telephone exchanges at San Francisco and Los Angeles.

The coast line route is about 473 miles and is an all open wire lead, and as the commercial limit of the physicals upon which the phantom is to be built is 474 miles, it is expected that with the 10 to 14 per cent increased transmission possible with phantom circuits, that the repeating coil losses will be sufficiently overcome so as to make possible acceptable speech transmission between the locals off of the two exchanges.

As the plant economy fully justifies the placing of additional repeaters in long haul message circuits so as to admit of their use in divisional telephone service, the superintendent of telegraph of the Southern Pacific Company is arranging his outside wire plant so as to admit of the use of all existing copper multiplex telegraph circuits in simplex, composite and phantom telephone service as well.

Of Interest to the Trade

Stromberg-Carlson Literature

Pamphlets 41 and 42, covering the revised, improved and complete line of standard central energy and local battery telephones of the Stromberg-Carlson Telephone Manufacturing Company have just been issued. Special attention is called to the new method of coding telephones, which is for the purpose of simplifying the editing of orders and describing standard telephones of similar types. It will be noted that the company has retained its type number, the common number of the standard telephones that have been made well known to the trade by continual advertising for some time. It has always been a feature of the company's advertising to show the code number of the telephone illustrated. This has proved to be valuable because it has made well known such telephones as No. 896 type, etc., so instead of having several different numbers not in proper serial order to describe telephones of the same kind equipped with different resistance ringers, etc., the company has selected the common type number for the compact wall telephone and then covered any variation in the equipment by a letter affixed to the type number. This scheme makes it possible for a customer to identify the complete line of telephones for either the local battery or central energy system by a few type numbers.

For example: When the No. 951 type telephone is spoken of, everybody is immediately familiar with the fact that this describes the standard office wall type telephone, etc. Heretofore under the old system this same type telephone with a different condenser and a different ringer would have several different numbers as, for example: 951, 967, 980, 999, instead of 951-A, B, C and D.

Attention is also called to several new types of telephones shown in these pamphlets, namely, the No. 1126 type wooden resistance telephone for central energy systems, and the No. 896 type harmonic magneto telephone.

Folders describing the Hiawatha anchor and the Hallett steel gain are among recent literature sent out by the Hallet Iron Works, Chicago.

Mine Rescue Telephone Equipment

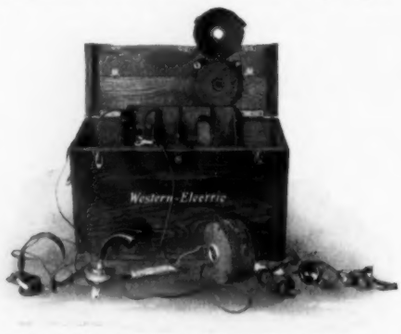
The problem of devising ways and means for the protection of human life in mines is probably the most important question before mine operators and the Federal Bureau of Mines today. The laws of practically every state in which mining operations are carried on call for regular inspections and also contain many safety regulations, not the least of which, in a number of the states, is a section making compulsory the use of telephones underground.

Throat Transmitter and Head Receiver Worn by Helmet Man.

During the past few years, the Western Electric Company has furnished several thousand mine telephones for underground use. Through this intimate associaton with those interested in mine safety work, attention was directed to the urgent need for some means of instant and continuous communication between an advance, or rescue party equipped with its oxygen apparatus and the rear party outside the mine. In the past, members of rescue parties have lost their lives where loss of life could have been prevented by a quick and reliable means for summoning aid.

The demand for this type of equipment has been met by the Western Electric Company, which has succeeded in producing a light, serviceable and extremely simple telephone equipment for use in rescue work. In developing the apparatus, the United States government's Bureau of Mines was frequently consulted in order that every requirement of this very severe service might be fully covered.

A man wearing an oxygen helmet, which covers his mouth, cannot use the ordinary type of telephone transmitter, so that a special type of transmitter, known as the "throat" transmitter has been developed to meet this unusual condition. The transmitter is very light and compact and is provided with a soft rubber cup to adapt itself to the curves of the throat. This throat transmitter has been found by actual test to transmit speech practically as well as the standard instruments. Both receiver and transmitter are held firmly in position in such a manner that they will not interfere with any type of oxygen apparatus now on the market. The telephone equipment used by the man at the outside or directing end is a standard switchboard operator's set consisting of a chest type transmitter and head band receiver.



Standard Rescue Telephone Equipment.

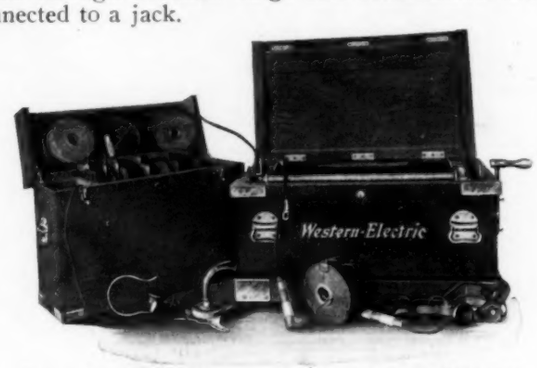
The rescue party is connected with the rear by means of a small wire cable consisting of two copper conductors insulated with black enamel and two servings of silk, all of which is covered with a stout linen braid impregnated with moisture resisting compound. This wire is in 500 foot coils and is carried in a leather case fastened to the helmet man's belt, paying out as he advances. As the coils are very light, weighing less than three pounds apiece, several of them can easily be carried and as one is run out, another can be connected by means of a plug and jack combination. The wire is so wound that it cannot become tangled and will pay out in whatever position the helmet man may have to assume. The total weight of telephone equipment carried by the helmet man, including one coil of wire, is only a little over five pounds.

One end of the coil is equipped with an aluminum encased plug which connects with the head receiver and throat transmitter by means of an aluminum encased jack. The other end is equipped with a similar jack connecting with a plug and cord running to a battery and apparatus box. This box is an essential part of the equipment and must be located at the point from which the rescue party is being directed. It contains eight dry batteries mounted in a Patterson screw type battery holder and a key, two jacks and a battery gauge mounted in a removable compartment. The operator's telephone set is connected to the apparatus and battery box by means of a cord, plug and jack. The key operates in two directions and has three positions—neutral, right and left. In the neutral position, the batteries are in circuit; when operated one way the batteries are disconnected to save current when the apparatus is not in use; while in the other position the battery gauge is connected across the battery terminals so that the condition of the batteries can be determined. It would be a serious matter to discover that the batteries were too weak for service after the rescue party had entered the mine.

Standard Rescue Telephone Equipment in Use.

In many cases it may be found desirable to use cable for carrying the talking circuit down a shaft or into a slope up to the edge of the danger zone. For this purpose a large box, including a cable reel, is furnished. The box is a heavily reinforced, metal cornered box made of ash containing an aluminum reel holding 1,300 feet of specially strong and flexible twisted pair cable, having a 30 per cent pure Para rubber insulation, the highest grade obtainable. A heavy ratchet and pawl are provided to prevent the reel from turning after enough cable

has been paid out. Connections with the apparatus box and the coil carried by the helmet man are effected by means of aluminum encased jacks and plugs, while electrical contact with the inside end of the reeled cable is made through collector rings and commutator brushes connected to a jack.



Rescue Telephone Equipment Including Cable and Reel Box.

The entire outfit has been designed and constructed with a view to providing practical and serviceable telephone equipment for mine rescue work. Service tests have proven that this object has been attained and the telephone equipment should be of incalculable benefit to those engaged in rescue work.

Voltage Tests on Insulated Wire Increased

The voltage tests on Simplex Caoutchouc (B. C.) wires and cables, as shown in the following table, exceed by from 100 to 185 per cent, according to size, the underwriters' requirements for the same thicknesses of insulation. Simplex Caoutchouc is manufactured by the Simplex Wire & Cable Company, Boston, to meet the demand of those who wish something better than code wire.

It should be noted that the voltage tests on Simcore, 1911 code wire, exceed the underwriters' tests by from 33 1/3 to 100 per cent.

Size B. & S. Gauge	Required by Underwriters Volts	Simcore Volts	Simplex Caoutchouc "B. C." Volts
14 to 8	1,500	2,000	3,000
6 to 2	2,000	3,000	5,000
1 to 4.0	2,500	5,000	8,000
225,000 to 500,000	3,000	6,000	9,000
525,000 and larger	3,500	7,000	10,000

ALL TESTS FOR ONE MINUTE.

The tests on the larger sizes of both Simcore and Simplex Caoutchouc (B. C.) have been increased more than on the smaller sizes because the voltage tests of the underwriters are much more severe on small than on large wires.

It is recognized that the best means of searching out possible imperfections in insulated wires and cables is the voltage test. These increased tests, therefore, not only insure superior quality but are a measure of that quality as well.

The post and telegraph department, Rome, Italy, invites orders for the construction of telephone lines, either by overhead wires or by underground cable between Turin, Genoa, Milan, Bologna, Florence, Rome, and Naples, with branches from Bologna to Venice, and from Florence to Leghorn; also for constructing interurban and international telephone lines at an estimated cost of $10,608,970.

Durability of Storage Batteries

It is sometimes stated that storage batteries will not stand much abuse and that in order to give service they require constant care and must be operated under ideal conditions.

A striking proof that storage batteries are reliable and that they will operate even under the most adverse conditions is shown in the experience of the Cincinnati and Suburban Bell Telephone Company during the recent flood in the Ohio valley.

This telephone company has two batteries of the "chloride accumulator" located at its exchange in Hamilton, Ohio. One battery consists of 11 cells of type G-11 and the other battery of 11 cells of type F-9. The entire power plant in which these batteries were located was submerged in the muddy water of the Miami river about 6 o'clock on the evening of March 25 and remained under water until the evening of the 27th.

During this submersion the batteries continued to furnish the necessary current for signaling and transmission from the time of their submersion up until 3 a. m. on the 27th. As soon as the water had subsided sufficiently to allow an inspection, voltage and gravity readings were taken on the first set and showed three volts for the entire 11 cells and a specific gravity of 1,153 in the cell tested.

As soon as the power plant could be put in commission, which was at 1:25 p. m. on the 29th, the batteries were put on charge and continued so until about 10 p. m. on the same day without there having been any repairs of any kind made on these cells. The charge received during this time continued to operate the exchange during the remainder of the night and well into the next day.

The Lafayette Electric and Manufacturing Company, Lafayette, Ind., which makes an efficient and up-to-date line of telephones, switchboards and can top terminals, is now devoting a great deal of time and attention to portable car telephones. C. R. Moore, general manager, formerly connected with the electrical engineering department of Purdue University, has charge of the experimental and engineering departments. Anything that the telephone trade may want in the way of special apparatus can be made by this company. The sales department is under the management of R. E. McCarty, whose training and ability fit him well for the place, and he will answer with promptness and courtesy all inquiries regarding the company's line.

The New York Telephone Company filed with the Public Service Commission Second District of New York and the Board of Public Utilities Commissioners of New Jersey, its schedules on new toll rates which will go into effect July 1. According to officials of the company telephone users will be benefited to the extent of a $500,000 saving per year, the saving of course being based proportionately on the existing volume of traffic. The present method of charging for overtime calls will be abolished and instead of charging on the percentage basis of five minutes overtime as additional calls, the charges will be governed entirely by the exact number of minutes of the connection.

The Oshkosh guy anchor is fully described in a folder issued by the Oshkosh Manufacturing Company, Oshkosh, Wis.

Brevities of the Business

PERSONAL NOTES.

Bernard C. Groh, until recently chief engineer of the Illinois Telephone and Telegraph Company, has been named plant engineer of the Automatic Electric Company, which has established a new department to be devoted to co-operating in every way possible with telephone companies operating the Automatic system or contemplating its adoption.

Stephen Dudley Field died at his home at Stockbridge, Mass., on May 18, after an illness of four months. Mr. Field, who was sixty-seven years of age, was a nephew of the late Cyrus W. Field, of Atlantic cable fame, and of David Dudley Field, the eminent jurist. Mr. Field's name has been closely linked with much that has made for American electrical progress. He learned telegraphy in the early sixties at Pittsfield, Mass., and soon became an expert operator.

Charles E. Tarte, of the Citizens' Telephone Company of Grand Rapids, Mich., is chairman of a committee of the National Telephone Association appointed to gather data as to plant cost. He has compiled a list of about 160 questions divided into three groups covering all possible items of cost in building an exchange and is sending them out to the leading independent companies in the country and to the various state commissions. The Interstate Commerce Commission now has jurisdiction over the telephone companies and requires detailed reports as to operating expenses and construction cost and the data collected by Mr. Tarte will be useful in meeting the demands of the commission.

M. Barret is the name of the young man who has been appointed by the Lincoln Telegraph and Telephone Company as local manager in Crete City, Nebr., to take the place of Mr. Pflug, resigned. He comes from Nebraska City.

A. H. DeNike, division general manager; G. E. McCarn of Denver, general plant superintendent, and C. C. Campbell, district manager, of the Mountain States Telephone and Telegraph Company, Salt Lake City, Utah, made a ten days auto trip inspection of the company's lines and offices in southern Utah.

Gale D. Saltzbarger has resigned the office of superintendent of the Home Telephone Company's plant at Van Wert, Ohio.

George Spalding, Denver commercial manager of the Mountain States Telephone Company, was the principal speaker at the weekly luncheon of the Colorado Electric Club at the Albany Hotel recently. His subject was "The Wonderland of the Telephone." Spalding's talk was illustrated by stereopticon views, showing the inner workings of the telephone system.

F. W. Buff, vice president of the Home Telephone Company, at Spokane, Wash., has resigned. Buff had been with the Lane company for a number of years. On account of his orchard holdings at Hood River his time and attention are required there during the coming summer and fall, after which he will take a trip to the orient and later return to Spokane and engage in business for himself.

A. W. Anderson, chief switchboard man at the Wasatch exchange, Salt Lake City, Utah, died May 18, 1913. Mr. Anderson had been in the service for the past three years.

J. H. Brett has been placed in charge of the Michigan State Telephone Company's auditing and accounting department for western Michigan, which always has been located at Detroit as a part of the state system, but has been removed to Grand Rapids. This change was brought about through the efforts of Dudley E. Waters, who is one of the vice presidents of the company, and it became operative June 1.

N. W. Dow resigned his position as manager for the Farmers' Mutual Telephone Company at Clarinda, Iowa, and will remove his family to College Springs.

Theodore Hardee, who has had a vast amount of experience in world exposition work, has been appointed chief of the department of liberal arts of the Panama-Pacific exposition to be held in San Francisco in 1915.

B. F. Wasson, president of the National Telephone & Electric Company of Clinton, Ill., inventor of the Wasson reel and author of "Construction Signal Rules," paid Telephone Engineer a visit recently.

R. W. Hutchinson, Jr., advertising and publicity manager of the International Motor Company, New York City, resigned, to take effect June 1. Mr. Hutchinson has had charge of the advertising and publicity for the International Motor Company since the time of its organization and previous to that time was connected in a similar capacity with the Sauer Motor Company. Mr. Hutchinson is an engineer of board experience and during his connection with the International Motor Company, has become known as one of the best-known advertising experts in the motor truck industry. His future plans are indefinite at this time.

ELECTIONS.

The annual meeting of the Mt. Vernon Farmers' Telephone Company, at Oak Ridge, Minn., was well attended and many important subjects were discussed. The officers elected for the ensuing year were: President, Peter Kreidermacher; vice-president, Wm. Thompson; secretary, Wm. Drenckhahn; treasurer, John Pfeffer. The past year has been a successful one for the company.

The Mutual Telephone Company at Eldora, Iowa, at its annual meeting elected the following officers: Thomas Larson, president; C. A. Reaver, vice president; W. E. Rathbone, treasurer; Helen Hall, secretary; J. H. Hadley, F. J. McNeil, Charles Moser and C. F. Stauffer, directors.

A. Hawkins has been made manager of the Bishop telephone system at Bishop, Texas. The old Bishop-Kingsville telephone line has been removed. The Bishop system will be thoroughly overhauled and much new and improved equipment installed.

The State Road Telephone Company of Clarinda Pt., Ia., held its annual meeting at McCunn school house and elected the following officers: Charles Shafer, president; Herman Morsman, secretary and treasurer, and F. C. McCunn, lineman.

About 75 of the most prominent farmers of Ursa, Ill., township met at the Ursa town hall and organized the Farmers' Mutual Telephone Company. They elected the following officers: Frank Allison, president; L. C. Shriver, vice president; Wm. Duncan, secretary; C. R. McNay, treasurer. The first three named will act as a committee to see on what conditions this company's line can get into Quincy. This will be a stock company of farmers.

The Boone County Telephone Company is the name of a new corporation organized at Harrison, Ark., which has purchased the plant of the Southwestern Telephone and Telegraph Company. The company has a capital stock of $12,000. The officers of the new company are: Dr. J. H. Fowler, president; W. H. Cecil, vice president; Claude Wilson, secretary and treasurer, with Troy Pace, Dr. J. L. Sims, Scott Capps, H. W. Redus and A. C. Christenson as the board of directors. The new company is now negotiating with the stockholders of the Union line, controlled by residents and farmers of Boone, Newton and Carroll counties, with the object of adding it to the new system which is being organized here.

At the annual meeting of the stockholders of the Oconto Rural Telephone Company, Oconto, Wis., the following directors for the ensuing year were elected: D. H. Barker, Yarwood Matravers, A. B. Reeves, J. D. McKeever, G. A. Glynn, J. B. Chase, L. E. Whiting, Ed Couillard and W. M. Comstock

Directors of the Cuyahoga Telephone Company of Cleveland, Ohio, re-elected its officers for a year—Charles A. Otis, president; C. Y. McVey, vice president and general manager; H. O. Leinard, secretary-treasurer, and C. F. Haskins, auditor. The directors declared the usual quarterly dividend of 1½ per cent on the preferred stock, payable July 31, to holders of record July 15.

At the annual meeting of the Canton and Bryant Telephone Company at Canton, Ill., the following officers were elected: President, Thomas Carter; vice president, William Miller; secretary and treasurer, C. E. Walker. J. A. Jameson was elected director for a term of three years.

NEWS FROM THE FIELD.

ARKANSAS.

The Franklin County Telephone Company at Charleston has sold its system to the Citizens' Telephone Company of Paris. The Six-Mile Telephone Company of Ratcliff, Southwestern Telephone Company and Dr. Hornsbee's systems of Booneville, the Scranton Telephone Company of Scranton and the Logan County Telephone Company of Paris have also sold their systems to the Citizens' Telephone Company, making South Franklin and all of Logan county into one system. Persons holding stock in the old companies hold the same in this new company.

The following named persons are the newly elected officers: Conrad Elskin of Paris, general manager: Directors: Conrad Elskin and Robert Utley, Paris; Joe Yunker, Charleston; Dr. Hornbee, Booneville; Dr. Hunt, Clarksville; James Grooms, Ratcliff, and Mr. Hitchcliff of Little Rock.

The Citizens' Telephone Company at Little Rock, filed a certificate showing that it had increased its capital stock from $25,000 to $50,000; that the number of directors of the company had been increased from five to seven and that it had decided to establish exchanges at Charleston, Booneville, Branch, Ratcliff, Scranton and Subiaco.

The Citizens' Telephone Company of Paris has filed a certificate of increase of capital stock from $25,000 to $50,000, and the number of directors from five to seven.

CALIFORNIA.

The first telephone installed at the new Woodlake station direct from Visalia is in operation. Woodlake now has the most complete and perfect farmers' line in the state, according to officials of the Pacific Telephone & Telegraph Company. The system runs as a farmers' line from Visalia on an open circuit to Redbanks, where five leads branch off to various portions of the Woodlake district. The service now to Woodlake, 16 miles, is as perfect as a long distance line, and is the first of its kind in the state. It was installed by the Woodlake people at a cost of about $7,000.

DELAWARE.

The Phone Call Recorder Company, Wilmington, Del., capital stock, $250,000. To conduct a general business of the manufacture, sale of electrical utensils of all kinds, especially telephone recorders. Incorporators, R. Boyd Cooling, Clarence J. Jacobs, Henry W. Davis, all of Wilmington, Del.

FLORIDA.

The Peninsular Telephone Company of Tampa has bought a large lot at the corner of Zack and Morgan streets and announces that it will at once build a telephone office there that will be adequate for the needs of this growing city. Financial arangements were made by President W. G. Brorein during a recent trip to the north and the building will be started soon. The company is doing an ever increasing business with the rapidly growing towns and cities of South Florida and will provide for this fully. In all probability the system will be changed to an automatic when the new building is completed. The automatic system has been given a tryout in the West Tampa exchange and has proven a success. It is used in Havana where humidity conditions are similar to what they are here and has been successful there.

GEORGIA.

The Dalton Telephone Company is asking the city council for a renewal of its franchise, which soon expires. The company will, as soon as the renewal is granted, begin extensive cable work, and will substitute central energy telephones for the ones now in use.

The Southern Bell Telephone Company has just purchased a large lot on the corner of Toombs and Valley streets at Valdosta and has already begun getting it ready for the handsome new office building which the company is to erect there. It is expected that the work will begin right away. The new office and equipment will cost about $80,000 and the improvements which the company will make there during the present year will amount to considerably more than $100,000.

The town of Alston has granted a franchise to Stanford Brothers of the Mount Vernon Telephone Company, for the erection of a telephone exchange. This exchange will be in operation within sixty days, and will give connection with Vidalia, Lyons and Mount Vernon.

IDAHO.

The North Idaho Telephone Company has started work on extending the service to Government and Deadwood gulches, west of Kellogg, and a large number of additional 'phones will be installed.

The Lewiston Orchards Rural Telephone Company will construct a line to serve Lewiston Orchards, under the direction of W. H. Bankson, president of the company.

The Mountain States Telephone Company has a force at work on the construction of a new rural telephone line that will accommodate a number of farmers residing in a section about four miles east of Nampa. Among the new subscribers are William Schey, E. H. Estes, John Mitchell, M. H. Sebern, H. M. Shok, Peter Thiel, G. F. Claycomb, W. F. Bostic, Dr. Payne and G. H. Kinney.

ILLINOIS.

The Lanark Mutual Telephone Company at Palo laid an underground cable of 150 pairs north on Main street, from the office and under the railroad to the Ella Price corner. The distance is about two blocks.

Plainfield has granted the Inter-State Telephone Company a 25-year franchise. The officers of the company are particularly pleased because when an application was made for a grant some time ago there was some opposition by village trustees who declared in favor of only one company. The company has also secured a franchise for 25 years at Frankfort and Elwood. In every city where a new right has been given the company has been allowed to increase the rates.

The fact that the Interstate Telephone Company was operating in Rock Falls without a franchise was brought to the attention of the council. City Attorney Cantlin recommended that the company be instructed to furnish the city with an indemnity bond in lieu of the franchise.

An ordinance granting a new franchise to the Inter-State Telephone Company was passed by the Plainfield council. This franchise permits the telephone company to raise the rates of single party lines to a sum not to exceed $1.50 a month in private house and $3 for business telephones.

The Central Union Telephone Company has supplied the Lewistown office with a fire fighting equipment.

INDIANA.

Nine telephone operators, who struck for higher pay at Princeton, were granted the increase they demanded. The telephone company agreed to pay them 4 cents more an hour and arrange a better shift.

IOWA.

Engineers for the Tri-City Automatic Telephone Company are preparing plans for the construction of exchanges and systems in Davenport, and Rock Island and Moline, Ill.

The Independent Mutual Telephone Company has contracted for a lot of new cables and for a new switchboard at Shenandoah. The improvements arranged for will amount to some fifteen thousand dollars. This is one company that has made a success in Shenandoah while several others failed. It has succeeded because of good business management.

The city of Waboo may reach a settlement of its telephone rate war which will prove satisfactory in time—and again it may not. Under an ordinance passed the telephone company is granted a 25 year franchise and the subscribers are given individual business telephones for $2.75 per month and residence telephone for $1.25 per month.

KANSAS.

The Bell Telephone Company is stringing a new copper circuit from Kingman to Harper, and also another line from Harper to Sharon.

KENTUCKY.

Eureka Telephone Company, Palesville; capital $500. Incorporators: E. L. Peyton, M. F. Compton, David Clark and E. F. Gabbert.

Articles of association of the Jeffersonville Home Telephone Company have been filed. The franchise requires work to start within sixty days of the granting of the permit and half of that time has already elapsed. The articles of association show that the capital of $10,000, divided into 100 shares of $100 each, is held by the five directors and incorporators.

MICHIGAN.

The Michigan State Telephone Company will spend $23,000 in rebuilding its lines between Kalamazoo and Paw Paw.

Extensive improvements and repairs are being made in the Bell Exchange at Petoskey by a crew of linemen from Detroit. A large number of poles were taken down and a smaller number erected. The improvements included eliminating considerable of the construction of the old Swaverly company, which merged with the Bell over a year ago. The new construction consists of 100 new poles, 16,000 feet of aerial cable, 10 miles of new wire, 2,000 feet of underground cable and 18 cross arms. There are 225 less poles than have hitherto been in use.

Because the Michigan State Telephone Company has withdrawn its free service between Marshall and Ceresco, Marshall patrons are up in arms. The telephone company now charges 10 cents for Marshall patrons to talk to Ceresco, a distance of six miles, but patrons of the Ceresco office can still talk to Marshall free of charge.

The Valley Telephone Company of Saginaw, has purchased the 250 telephone exchange at Unionville.

MINNESOTA.

A new telephone company has been organized and a line will be built from Staples southwest. The poles are now being taken out and will be set as far as L. C. Gateson's and Albert Hagenson's farms. The officers are: President, L. C. Gateson; vice president, A. H. Buckman; secretary and treasurer, Ole Johnson; directors, A. T. Haugen, P. K. Olson, Albert Hagenson, Ole Gorder and Swan Nelson.

The Port Hope Rural Telephone Company, which was organized recently at Bemidji has begun work on the construction of 20 miles of line from the central part of Port Hope township to Tenstrike and Farley. Connection with the Bell company will be made either at Tenstrike or Farley.

MISSISSIPPI.

Re-established telephone service to Jonestown has confirmed the report of heavy losses in the big fire there recently that almost wiped out that town. The loss is placed at over $25,000.

According to the reports of the branches of the Home Telephone Company, the stock of which is owned in Shamokin, Pa., which are in operation in Mississippi, there was a net improvement in earning capacity reported for the March quarter, 1913. The three branches reporting are located at Hattiesburg, Jackson and Meridian. The Mississippi Home Telephone Company, of Jackson, reports total receipts of $3,900.49, with an expense of $2,004.73. The Meridian Home Telephone Company shows the larger volume of business, having earned a total of $4,640.30; expended $3,259.50. The Hattiesburg branch earned $3,900, and expended $1,738.04.

NEW YORK.

The New York Telephone Company has purchased the property at Rochester adjoining its North Fitzhugh street building on the north and will remodel and enlarge its present structure to the full width of the widened lot making the new building three stories high, 91 feet front and 159 feet deep. The improvements will cost $125,000.

Papers of incorporation for the Newport Telephone Company are in the hands of Leo Foss, manager of the company. New quarters have been secured on Bridge street.

NORTH DAKOTA.

The North Dakota Independent Telephone Company has started a crew out on the work of constructing a new copper circuit between Dickinson and Bismarck. The company is also constructing a new copper line between this city and Belfield, a distance of 22 miles west. The Independent Telephone Company has also put a line across the Little Missouri river, 80 miles north of Dickinson, which connects the Great Northern Railroad Company's grading crew with this city. The telephone company already had its line extended north by way of the aforesaid river. It was found that the railroad construction crews had to travel a distance of 40 miles to get in touch with the telephone line at Schafer. Therefore, the connection south is of great importance to these people.

OHIO.

Congress Franklin Mutual Telephone Company, Williamsport, postoffice address, Mt. Gilead, Ohio; J. B. Kizer and others.

The Young Hickory Telephone Company, McConnelsville, incorporated $15,000 by J. F. Leeper, Clyde Leeper and F. B. Smith.

Suit to compel the Central Union Telephone Company, a part of the Bell system, to abide by its contract to sell its plant at Lima to the Lima Telephone and Telegraph Company was filed here. Plans for a merger of the two companies operating at Lima were approved by the state public service commission March 4, last. Contract was made between the two companies by which the Lima company was to acquire the plant of the Central Union Company at a price of $205,000. The Central Union Company has refused to keep its part of this contract, the Lima company charges. The Central Union Company declares that litigation pending in Illinois prevents the sale of the plant at Lima.

OKLAHOMA.

New State Telephone Company of Reeding; capital, $3,000. Incorporators: L. G. Roles, E. W. Sibley, J. L. Van Valkenburg, Reading.

PENNSYLVANIA.

A farmers' rural telephone company has been organized at Centre Hill with these officers: President, Hampton Rice; vice president, William Oppie; secretary, Amos Armitage; treasurer, Lewis Quimby.

A complete plan for the reorganization of the Consolidated Telephone Companies of Pennsylvania has been prepared by a bondholders' committee. The underlying companies are the Lackawanna Telephone Company, of Scranton; the People's Telephone Company, of Wilkes-Barre; the Lehigh Telephone Company, of Allentown; the Honesdale Telephone Company and the Berwick Company. A new company will be organized and at the foreclosure sale all of the right, title and interest in the property will be purchased on behalf of the depositing bondholders, and thereafter conveyed and assigned to the new company. All such bondholders will participate in the distribution of the new securities.

The poles on the new route of the Conestoga telephone line, from Joanna to Hay Creek Mills, have been planted and the wires have been strung to Joanna Heights.

TENNESSEE.

The Cumberland Telephone & Telegraph Company at Lebanon has just completed local improvements amounting to between $50,000 and $60,000 which have greatly added to the efficiency of the service. The improvements have been going on for over six months and there have been nearly a hundred men on the job. All the overhead wires have been removed and placed in cables extending from the Public Square to the city limits. A plan is now on foot to secure another building in which to locate the plant departments and separate this altogether from the operating and business office.

TEXAS.

The Southwestern Telegraph and Telephone Company, among other improvements in its system at Teague, is putting a new toll line between this place and Mexia. It is also announced that as soon as this line is completed a new line will be constructed south to Jewett.

The Southwestern Telephone and Telegraph Company has moved into the splendid new quarters on the second floor of the Citizens' State Bank at Rockdale.

In the case of W. D. Coffey vs. the Farmersville Telegraph and Telephone Company at McKinney, for damages for loss of time on account of alleged personal injuries, the plaintiff was given a verdict for $2,500. Coffey is suing the company for $2,900, which covered expenditures and loss of time for his son, who was, it was alleged, permanently injured several months ago while in the company's employ.

The telephone exchange at Riviera has been moved into B. A. Whitcomb's new residence and a larger switchboard installed.

The Southwestern Telephone Company is making preparations to rebuild the plant at Hearne and has received considerable material to be used in the construction. When the work is completed the plant there will be one of the best in that section.

WASHINGTON.

The city council at Tacoma denied the application of the Sunset Telephone & Telegraph Company to string a cable across Lincoln bridge. The action was taken on the ground that the telephone company is leasing to the Western Union Telegraph company its conduits under Pacific avenue for stringing wires. In crossing Pacific avenue, the Western Union is violating its franchise, the commissioners said.

A deal was made whereby E. E. Segel of Malden became owner of the stock of the Malden Supply and Power Company, the local telephone system.

WEST VIRGINIA.

The Bell Telephone Company has placed in position at the southwest corner of Tenth and Main streets, Wheeling, a massive chestnut pole 55 feet long to accommodate their cables and wires. A pole that size delivered and ready for sticking in the earth costs an even $50.

WISCONSIN.

The plans for a $40,000 building for the Rock County Telephone Company at Janesville, an independent concern, are in the hands of architects.

The physical connection of the two telephone systems in Green Bay was made after considerable delay. Subscribers of either system may now use the line of the other company.

The Tri State Telephone and Telegraph Company plans to extend its lines from Roberts, eight miles south of New Richmond, to the head of the lakes. The company contemplates erecting three copper circuits the entire distance of approximately 12 miles.

The farmers around Beloit have organized a co-operative telephone company and in that way expect to cut down their telephone bills.